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#17

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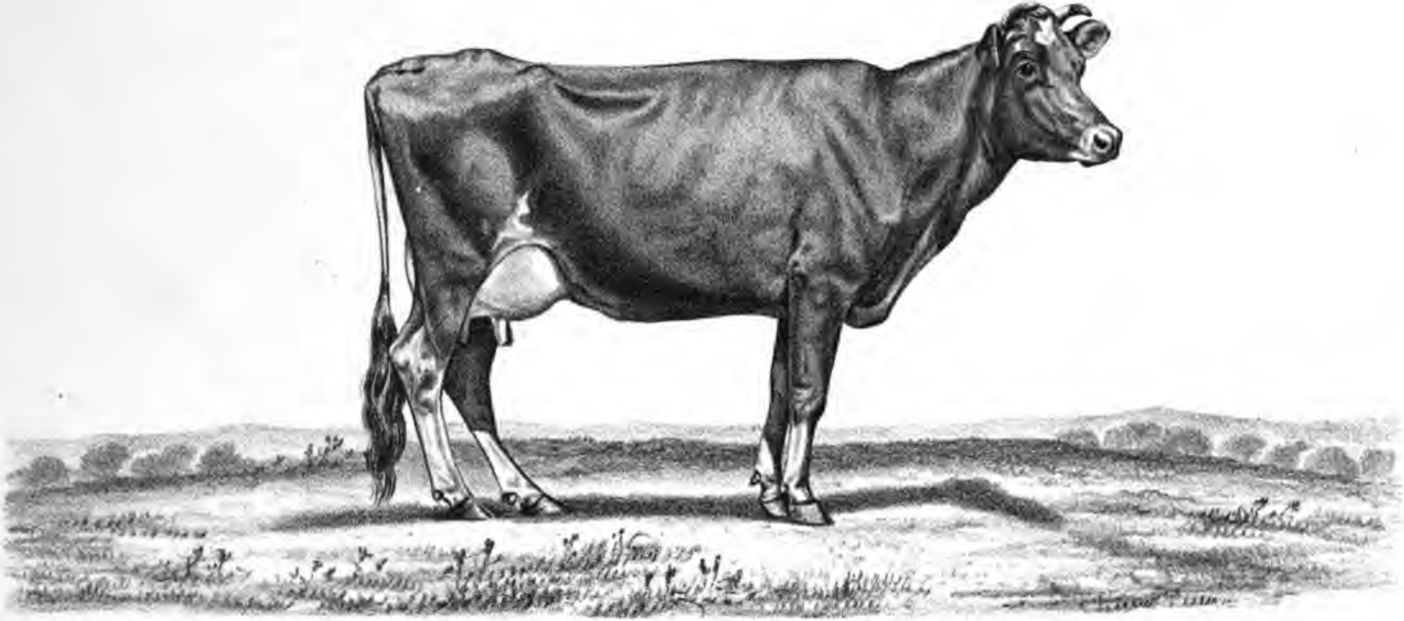

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THE COMMONWEALTH OF PENNSYLVANIA.

Pennsylvania. Dept. of agriculture
Annual report

AGRICULTURE OF PENNSYLVANIA,

CONTAINING

REPORTS OF THE STATE BOARD OF AGRICTLTURE, THE STATE AGRICULTURAL SOCIETY, THE STATE DAIRYMEN'S ASSOCIATION, THE STATE FRUIT GROWERS' ASSOCIATION, AND THE STATE COLLEGE,

FOR 1882.

HARRISBURG:
LANE S. HART, STATE PRINTER.
1883.

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SIXTH ANNUAL REPORT

OF THE

PENNSYLVANIA BOARD OF AGRICULTURE,

FOR THE YEAR 1882.

PENNSYLVANIA BOARD OF AGRICULTURE, 1882.

Members Ex-Officio.

His Excellency Governor H. M. Hoyt.
Hon. A. K. Dunkel, *Secretary of Internal Affairs.*
Dr. E. E. Higbee, *Superintendent of Public Instruction.*
Hon. J. A. Lemon, *Auditor General.*
Prof. James Y. McKee, *Acting President Pennsylvania State College.*

Appointed by the Governor.

		Term expires.
Dr. John P. Edge,	Downingtown,	1883
A. N. Perrin,	Titusville,	1884
Col. James Young,	Middletown,	1885

Elected by County Agricultural Societies.

Adams,	I. Garretson,	Bigler,	1885
Armstrong,	F. K. Patterson,	Freeport,	1883
Beaver,	R. S. Sterling,	Seventy-six,	1884
Bedford,	Jos. E. Noble,	Waterside,	1883
Berks,	W. G. Moore,	Womelsdorf,	1883
Blair,	F. Jaekel,	Hollidaysburg,	1885
Bradford,	H. L. Scott,	Towanda,	1883
Bucks,	E. Reeder,	New Hope,	1884
Butler,	John Dindinger,	Zelienople,	1885
Centre,	E. H. Hale,	Bellefonte,	1885
Chester,	Thos. J. Edge,	Londongrove,	1884
Clinton,	Joel A. Herr,	Cedar Springs,	1884
Columbia,	Chandlee Eves,	Millville,	1885
Crawford,	M. W. Oliver,	Springboro',	1883
Cumberland,	C. H. Mullin,	Mt. Holly Springs,	1883
Dauphin,	G. Hiester,	Harrisburg,	1885
Delaware,	Ellwood Harvey,	Chester,	1885
Erie,	J. Miles,	Milesgrove,	1883
Franklin,	C. Gilbert,	Chambersburg,	1883
Indiana,	G. W. Hood,	Indiana,	1883
Jefferson,	W. J. McKnight,	Brookville,	1884
Juniata,	Prof. D. Wilson,	Port Royal,	1885
Lancaster,	H. M. Engle,	Marietta,	1883
Lawrence,	D. H. Wallace,	New Castle,	1885
Lebanon,	C. H. Lantz,	Lebanon,	1885
Lehigh,	J. P. Barnes,	Allentown,	1884
Luzerne,	John B. Smith,	Kingston,	1885
Lycoming,	D. H. Foresman,	Williamsport,	1885
Mercer,	Robert McKee,	Pardoe,	1884
Montgomery,	W. A. Yeakle,	Flourtown,	1884
Montour,	M. D. L. Sechler,	Danville,	1883
Northampton,	Asher D. Shimer,	Bethlehem,	1885
Northumberland,	J. McFarland,	Watsontown,	1885
Somerset,	C. C. Musselman,	Somerset,	1883

			Term expires.
Schuylkill,	J. S. Keller,	Orwigsburg,	1884
Sullivan,	B. Vaughn,	Sciota Vale,	1884
Susquehanna,	Henry C. Tyler,	Montrose,	1883
Tioga,	S. F. Wilson,	Wellsboro',	1883
Union,	J. W. Shriner,	Lewisburg,	1884
Venango,	M. C. Beebe,	Pleasantville,	1883
Warren,	F. R. Miller,	Sugar Grove,	1883
Washington,	John McDowell,	Washington,	1884
Wayne,	N. F. Underwood,	Lake Como,	1885
York,	W. S. Roland,	York,	1883

OFFICIAL LIST.

President, (ex officio.)
Hon. H. M. Hoyt.

Vice Presidents.
G. W. Hood, Indiana. D. H. Foresman, Lycoming. Dr. J. P. Edge, Chester.

Executive Committee.
Hon. Henry M. Hoyt, M. W. Oliver, Crawford, A. N. Perrin, Crawford,
W. G. Moore, Berks, C. C. Musselman, Somerset, H. M. Engle, Lancaster,
W. S. Roland, York, G. Hiester, Dauphin, T. J. Edge, *(ex officio.)*

Advisory Committee.
W. S. Roland, York. W. G. Moore, Berks. H. M. Engle, Lancaster.
T. J. Edge, *(ex officio.)* G. Hiester, Dauphin.

Secretary.
Thomas J. Edge, Harrisburg.

Botanist.
Thomas Meehan, Germantown.

Pomologist.
Josiah Hoopes, West Chester.

Analytical Chemist.
Prof. F. A. Genth, University of Pennsylvania, West Philadelphia.

Agricultural Chemist.
Prof. W. H. Jordan, State College, Pa.

Consulting Veterinary Surgeon.
Prof. C. B. Michiner, D. V. S., American Veterinary College.

Veterinary Surgeons.
F. Bridge, D. V. S., Philadelphia. W. H. Hoskins, D. V. S., Philadelphia.

Entomologist.
Prof. W. A. Buckhout, State College, Pa.

Microscopist and Hygeinist.
Prof. H. Leffmann, Philadelphia.

Pisciculturist.
M. P. Pierce, Philadelphia.

Mineralogist.
Prof. E. S. Breidenbaugh, Gettysburg.

Geologist.
Prof. J. P. Lesley, State Geologist.

Stenographer.
Col. H. C. Demming, Harrisburg.

STANDING COMMITTEES.

Executive Committee.

Hon. H. M. Hoyt,
A. N. Perrin,
C. C. Musselman,
W. S. Roland,
M. W. Oliver,
W. G. Moore,
H. M. Engle,
G. Heister,
T. J. Edge.

Legislation.

M. C. Beebe,
W. McKnight,
C. H. Lantz,
N. F. Underwood,
A. N. Perrin,
W. G. Moore,
J. McDowell,
J. Noble,
C. H. Mullin.

Fruits and Fruit Culture.

H. M. Engle,
D. Wilson,
I. Garretson,
J. A. Herr,
J. S. Keller,
J. Calder,
G. Heister,
F. Jaekel.

Advisory Committee.

W. S. Roland,
H. M. Engle,
W. G. Moore,
G. Hiester,
T. J. Edge.

Forest and Forestry.

W. S. Roland,
J. Miles,
H. L. Scott,
Thomas Mehan,
D. H. Wallace,
R. McKee,
C. C. Musselman,
F. R. Miller.

Railroad Freights.

A. N. Perrin,
M. C. Beebe,
D. H. Foresman,
M. W. Oliver,
J. McFarland,
C. Gilbert.

Apiary.

M. W. Oliver,
J. A. Herr,
I. Garretson,
E. Reeder,
J. Hoagland,
J. McFarland.

Silk Culture.

J. P. Edge,
J. P. Barnes,
E. Reeder,
H. C. Tyler,
D. Wilson,
E. Harvey.

Grass and Grasses.

N. F. Underwood,
H. L. Scott,
M. W. Oliver,
E. Reeder,
F. R. Miller,
W. R. Shelmire,
J. S. Keller,
J. McDowell.

Preservation of Useful Birds.

C. C. Musselman,
F. Jaekel,
A. D. Shimer,
J. P. Barnes,
J. S. Keller,
G. Heister,
H. M. Engle,
M. W. Oliver.

Dairy and Dairy Products.

E. Reeder—*Chairman.*

Wool and Textile Fabrics.

John McDowell—*Chairman.*

Cereal Crops.

D. H. Foresman—*Chairman.*

AN ACT

To authorize the printing and binding of the reports of the State Board of Agriculture, and other State agricultural reports.

SECTION 1. *Be it enacted*, *&c.*, That there be published annually hereafter, fourteen thousand and fifty copies of a work entitled the "Agriculture of Pennsylvania," which shall contain the annual reports of the State Board of Agriculture, the State Agricultural Society, the State Dairyman's Association, the State Fruit Growers' Association, and the State College, for the use of the Senate three thousand copies, for the use of the House nine thousand copies, for the use of the State Board of Agriculture one thousand one hundred copies, for the use of the State Agricultural Society three hundred copies, for the use of the Dairyman's Association three hundred copies, for the use of Fruit Growers' Association one hundred and fifty copies, for the use of the State College fifty copies, for the use of the Executive department fifty copies, for the use of the State Library for exchange fifty copies, and for the Horticultural Society of Pennsylvania fifty copies.

SECTION 2. The matter for said volume shall be proportioned to the several organizations, as follows: To the State Board of Agriculture, two hundred and fifty pages; to the State Agricultural Society, two hundred pages; to the State Dairyman's Association, one hundred pages; to the State Fruit Growers' Association eighty pages, and to the State College twenty pages, the whole volume not to contain more than six hundred and fifty pages: ***Provided***, That each organization shall compile and arrange its own matter, and that no matter shall be used by either which is not original and legitimate to the organization offering the same.

SECTION 3. For the compilation, arranging and indexing of said matter, the sum of seven hundred and thirty dollars is hereby annually appropriated, to be paid out of any money in the treasury not otherwise appropriated, upon the presentation of the receipt of the Superintendent of Public Printing and Binding that all the matter has been delivered to him; said sums to be divided as follows: To the State Agricultural Society, two hundred and fifty dollars; to the State Dairyman's Association, three hundred and fifty dollars, and to the State Fruit Growers' Association, one hundred and thirty dollars; and that each organization shall deliver the whole of its report in manuscript to the Superintendent of Public Printing on or before the first day of November of each year.

SECTION 4. That the State Board is hereby authorized to publish in pamphlet form, quarterly reports of crop returns from correspondents, epidemic or endemic diseases among domestic animals, experiments, analyses, et cetera, et cetera, the same not to exceed forty-eight pages each nor more than one thousand numbers.

APPROVED the 24th day of May, 1878.

J. F. HARTRANFT.

PROCEEDINGS

OF THE

PENNSYLVANIA BOARD OF AGRICULTURE.

ANNUAL MEETING, 1882.

At the annual meeting, held in Harrisburg, commencing Wednesday, January 25, 1882.

Board called to order at half-past two, P. M., by Vice President **GEORGE W. HOOD**, of Indiana, in the chair.

Present, Messrs. Edge, of Chester; Perrin, of Crawford; Young, of Dauphin; Sterling, of Beaver; Noble, of Somerset; Moore, of Berks; Scott, of Bradford; Herr, of Clinton; Oliver, of Crawford; Miles, of Erie; Hood, of Indiana; Engle, of Lancaster; Barnes, of Lehigh; Musselman, of Somerset; Keller, of Schuylkill; Beebe, of Venango; Miller, of Warren; McKnight, of Jefferson; Roland, of York; Reeder, of Bucks; Smith, of Luzerne; and Secretary.

On motion, the Chair named Messrs. Roland, Oliver, and Musselman a committee to receive and act upon the credentials of newly elected members.

On behalf of the Executive Committee, Mr. **MOORE**, of Berks, offered the following:

That hereafter the annual meeting be on the second Wednesday in January, of each and every year, (instead of the fourth Wednesday as heretofore.) Amended by **FAHNESTOCK**, of Adams, so as to read:

"The Tuesday following the third Wednesday in each and every year."

Subject discussed by Messrs. Beebe, Herr, Keller, Moore, Hood, Engle, McFarland, Musselman, Miles, and Dr. Edge, and, on motion of Mr. **MOORE**, seconded by Mr. **HERR**, postponed until after the receipt of the report of the Committee on Credentials of new members.

On behalf of the committee to examine and audit the accounts of the Secretary, Mr. **PERRIN** reported that they had performed their duty, and found the accounts to be correct. On motion of Mr. **KELLER**, seconded by **ENGLE**, report adopted and committee discharged.

On behalf of the Executive Committee, Mr. **BARNES** reported in favor of changing section nine of the by-laws, so as to read as follows: "It shall be the duty of any member in attendance at the meetings of the Board, desiring to absent himself permanently from the sessions, to first ask and obtain the consent of the Board." After full discussion, adopted, and ordered printed as part of the by-laws.

On behalf of the Committee on Credentials, Dr. **ROLAND** reported that they found that Messrs. Garretson, of Adams; Heister, of Dauphin; Lantz, of Lebanon; Underwood, of Wayne; Eves, of Columbia; McDowell, of Washington; Foresman, of Lycoming; and Smith, of Luzerne, were entitled to seats as members of the Board; that Mr. McKee, of Mercer, was properly entitled to a membership made vacant by the resignation of Mr. Hoagland, and that the credentials of Messrs. Shimer, of Northampton; McFarland, of Northumberland; Wilson, of Juniata; Wallace, of Lawrence, and Dindinger, of Butler, were referred to the Board for its action.

After a full discussion of the merits of each case, all were admitted as representatives from their respective counties.

On motion of Mr. **BEEBE**, Mr. Lantz, of Lebanon, was excused from further duty at the session.

The election of officers being next in order, the chair named Messrs. Barnes and Noble, as tellers, to conduct the election.

Messrs. Hood, Foresman, Beebe, Roland, Perrin, and Dr. Edge were then nominated as vice presidents, when, on motion of Mr. **MCFARLAND**, the nominations were closed, and the election proceeded with.

The tellers announced that Messrs. Hood, Foresman, and Dr. Edge had been elected.

Messrs. Oliver, Heister, Müsselman, Dr. Edge, McFarland, Underwood, Wallace, Engle, Herr, Roland, Moore, Wilson, and Perrin were nominated as members of the Executive Committee, and the tellers announced that Messrs. Oliver, Heister, Musselman, Roland, Engle, Moore, and Perrin were elected.

There being but one name for the position of Secretary, the Vice President was directed to cast the ballot of the Board for Thomas J. Edge to fill the position.

On motion of Mr. **MOORE**, it was the duty of the Executive Committee to name the honorary officers of the Board.

After consultation, the Executive Committee named the following officers for the ensuing year:

Botanist—Thomas Meehan, of Germantown.
Cronologist—Josiah Hoopes, West Chester.
Analytical Chemist—Prof. F. A. Genth, Philadelphia.
Agricultural Chemist—Prof. W. H. Jordan, State College.
Consulting Veterinary Surgeon—Prof. C. B. Michiner, D. V. S.
Veterinary Surgeons—F. Bridge, D. V. S., and W. H. Hoskins, D. V. S.
Miscroscopist—Dr. H. Leffmann, Philadelphia.
Entomologist—Prof. W. H. Buckhout, State College.
Mineralogist—Prof. E. Breidenbaugh, Gettysburg.
Geologist—Prof. J. P. Lesley, State Geologist.
Stenographer—Col. H. C. Demming, Harrisburg.

When, on motion, the nominations were confirmed, and the Secretary directed to inform the officers of their election.

On motion of Mr. **SCOTT**, of Bradford, the proposition of the Executive Committee to a change in the time of the annual meeting was then taken up, and after discussion by Messrs. Beebe, Scott, Moore, Roland, Engle, Foresman, and Perrin, the subject was postponed indefinitely.

Mr. **MCFARLAND**, of Northumberland, offered the following:

"*Resolved*, That it shall be a standing rule of the Board hereafter, that all credentials of new members shall state explicitly, on the authority of the county commissioners, or other proper official or officials, that the county society is entitled to a bounty from the treasury of the county." Which was, after discussion, laid on the table.

Mr. **BEEBE**, of Venango, offered the following:

"*Resolved*, That it is the sense of this Board that the outlaying farms connected with the State College be sold, and the proceeds appropriated to the establishment of an analytical and practical experimental station at State College." Which, after discussion, was referred to a committee consisting of Dr. Edge, Prof. McKee, and Mr. Musselman.

Standing committees on Railroad Discrimination, Silk Culture, Sugar Beets and Beet Sugar, Forests and Forestry, Fruits and Fruit Culture, and Legislation made partial reports, and were continued. The committee on Museum was released from further service.

On motion, Messrs. Moore and Hiester were excused from further service at the session.

On motion, the evening session was set apart for an address upon Agricultural Education, by Prof. S. B. Heiges, of York.

Adjourned to meet at seven, P. M.

At an adjourned session, held Wednesday evening, January 25, 1882, Vice President Hood in the chair.

By special request, Prof. S. B. **HEIGES**, of York, delivered an address on Agricultural Education, the subject-matter of which was discussed by Messrs. Young, Jordan, Wallace, Wilson, Heiges, Perrin, McKee of Centre, Herr, Eves, Roland, Smith of Luzerne, Hiester, Moore, Barnes, Garretson, Mantor, and Secretary.

By request, Mr. **MOORE**, of Berks, read an essay by Mr. Jaekel, of Blair, on "The Industrial Education of America as Compared with that of Europe."

Adjourned to meet Thursday, January 26, 1882, at half-past eight, A. M.

At an adjourned session held Thursday, January 26, 1882.

Board called to order at half-past eight, A. M., Vice President Foresman in the chair.

Present—Messrs. Perrin, McKee of Centre, Edge, Young, Garretson, Sterling, Scott, Herr, Reeder, Oliver, Eves, Miles, Engle, Barnes, Beebe, Foresman, Sechler, McFarland, Keller, Mullin, McDowell, Dindinger, McKee of Mercer, Noble, Moore, Hood, Musselman, Miller, McKnight, Wallace, Smith of Luzerne, Patterson, Hiester, and Secretary.

On motion of Mr. **OLIVER**, a Committee on the Apiary was added to the list of standing committees.

By request, Prof. W. H. **JORDAN**, of the Pennsylvania State College, addressed the Board on the subject of "The Relation of Soils and Crops to Heat and Moisture."

On motion, Messrs. Hood, Wallace, Keller, McFarlan, and Smith, were excused from further service.

On motion of Dr. **ROLAND**, it was

Resolved, 1. That membership in this Board can only be secured on certificate from such county agricultural societies as are entitled to membership.

2. That there may be adopted a uniform certificate for the admission of members, the Secretary is hereby authorized to prepare and have printed a blank form, for the convenience and use of county societies.

On motion, Washington was selected as the place for the next meeting, and the Advisory Committee requested to fix the time at which it shall be held.

On motion, adjourned until two, P. M.

At an adjourned session held Thursday, January 26, 1882.

Board called to order at two, P. M., Vice President Foresman in the chair.

On motion, Messrs. Wilson and Noble were granted leave of absence for the remainder of the session.

Mr. PATTERSON presented his credentials as member elect from Armstrong, which were received without the formality of a reference to a committee.

Mr. MUSSELMAN, of Somerset, then read an essay on "The Treatment and Management of Dairy Cows," which elicited much practical discussion.

Mr. BEEBE, of Venango, read an essay, by Robert McCalmont, on "The Common Law and Statutes of Pennsylvania, regulating Surface and Underground Water-Courses between Land-Owners," the subject-matter of which was discussed by Messrs. Noble, Roland, Beebe, Musselman, Reeder, McFarland, Herr, McKee of Centre, and Dr. Edge.

The PRESIDENT announced the standing committees of 1882, as follows:

Legislation.—Beebe, of Venango; McKnight, of Jefferson; Lantz, of Lebanon; Underwood, of Wayne; Perrin, of Crawford; Moore, of Berks; McDowell, of Washington; Noble, of Bedford; Mullin, of Cumberland; and Musselman, of Somerset.

Forest and Forestry.—Roland, of York; Miles, of Erie; Meehan, of Philadelphia; Wallace, of Lawrence; McKee, of Mercer; Musselman, of Somerset; Scott, of Bradford; and Miller, of Warren.

Railroad Discrimination in Freights on Agricultural Products.—Perrin, of Crawford; Beebe, of Venango; Foresman, of Lycoming; Oliver, of Crawford; McFarland, of Northumberland; and Gilbert, of Franklin.

Fruits and Fruit Culture.—Engle, of Lancaster; Wilson, of Juniata; Herr, of Clinton; Keller, of Schuylkill; Calder, of Dauphin; Hiester, of Dauphin; Garretson, of Adams; and Jaekel, of Blair.

Apiary.—Oliver, of Crawford; Herr, of Clinton; Garretson, of Adams; Reeder, of Bucks; Seth Hoagland, of Mercer; and McFarland, of Northumberland.

Grass and Grasses of Pennsylvania.—Underwood, of Wayne; Scott, of Bradford; Oliver, of Crawford; Reeder, of Bucks; Miller, of Warren; Shelmire, of Chester; Keller, of Schuylkill; and McDonald, of Washington.

Silk Culture.—Dr. Edge, of Chester; Barnes, of Lehigh; Reeder, of Bucks; Tyler, of Susquehanna; Wilson, of Juniata; and Harvey, of Delaware.

Beet and Sorghum Sugar.—Moore, of Berks: Shimer, of Northampton; Musselman, of Somerset; Stichter, of Berks; Garretson, of Adams; Sechler, of Montour; and Zerr, of Berks.

Mr. REEDER, of Bucks, read an essay on "Lessons of 1881, and the Outlook of 1882."

Mr. BARNES, of Lehigh, read an essay by Mr. Shimer, of Northampton, on "The Importation of Foreign Live Stock," the subject-matter of which was discussed by Messrs. Barnes, Engle, Wilson, Roland, and Jordan.

On motion, adjourned to meet at Washington, Washington county, Pa., at the call of the Advisory Committee.*

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* Since changed to Allentown, Lehigh county, Pa., May 23, 1882.

PROCEEDINGS OF SPRING MEETING, 1882.

A meeting of the Pennsylvania Board of Agriculture held at Allentown, commencing Tuesday, May 23, 1882.

Board called to order at seven forty five P. M., by D. H. Foresman, Vice President, in the chair.

Present—Messrs. McKee, of Centre; Edge, of Chester; Perrin, of Crawford; Garrettson. of Adams; Sterling, of Beaver; Moore, of Berks; Reeder, of Bucks; Dindinger, of Butler; Herr, of Clinton, Eves, of Columbia; Hiester, of Dauphin; Hood, of Indiana; Wallace, of Lawrence; Barnes, of Lehigh; Smith, of Luzerne; McKnight, of Jefferson; Foresman, of Lycoming; Sechler, of Montour; Shimer, of Northampton; Musselman, of Somerset; Keller, of Schuylkill; Tyler, of Susquehanna; Vaughn, of Sullivan; Beebe, of Venango; McDowell, of Washington; Underwood, of Wayne; Roland, of York, and Secretary.

Minutes of annual meeting read and approved.

Mr. BARNES, of Lehigh, then introduced Mayor Martin, of Allentown, who delivered an address of welcome, which was replied to on behalf of the Board by Vice President Foresman.

Letter of Washington County Agricultural Society inviting the Board to hold a meeting at Washington, Pennsylvania, was then read, and Dr. Roland, on behalf of the Advisory Committee, explained the reasons of that committee's change from Washington to Allentown. After discussion by Messrs. McDowell. Keller, Foresman, and Musselman, the change was indorsed by the Board. A similar invitation was also presented by Mr. Eves, from the Columbia County Agricultural Society, proposing a meeting of the Board at Bloomsburg, which the Society was directed to place upon record for future consideration of the Board.

On behalf of the committee of the annual meeting, to whom was referred the resolution in relation to the sale of the State experimental farms, and the establishment of a State experimental station, Dr. Edge reported progress, and asked to be continued to make full report at the October meeting.

On behalf of Committee on Legislation, Mr. Beebe made a partial report, which was accepted.

On motion of Mr. KELLER, seconded by Mr. BEEBE, Dr. Edge was excused from further service during the session of the Board.

The committee on programme of future sessions, (consisting of Messrs. Barnes, Beebe, and Roland,) reported a plan for each session, which was accepted, when on motion of Mr. BARNES, the Board adjourned until half past eight, A. M., Wednesday, the 24th

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At an adjourned session of the Board held Wednesday, May 24, 1882.

Board called to order at half past eight, A. M., by Vice President Foresman in the chair.

Present—Messrs. McKee, Perrin, Garrettson, Sterling, Moore, Reeder, Dindinger, Herr, Eves, Hiester, Hood, McKnight, Wallace, Barnes, Foresman, Yeakle, Sechler, Musselman, Shimer, Keller, Vaughn, Tyler, Beebe, McDowell, Underwood, Roland, and Secretary.

On motion of Mr. KELLER, the reading of the minutes was dispensed with.

On behalf of the Advisory Committee, Dr. Roland reported that they have agreed to propose Washington, Pa., as the place for the fall meeting of the Board, on October 18, at nine, A. M., as the time. The committee further recommended that the invitations of the Columbia County Agricultural Society to hold a meeting of the Board at Bloomsburg, and of the Eastern Experimental Farm, to hold a meeting at the Eastern Experimental Farm, be placed in the charge of the Secretary, subject to a future call of the Board.

In compliance with the instruction of annual meeting, the Secretary reported that he has prepared a draft of a blank form of a certificate of membership for the use of future members of the Board. After discussion by Messrs. Wallace, Beebe, Moore, Keller, Musselman, and the Secretary, the following blank form was adopted:

OFFICE . . . . COUNTY AGRICULTURAL SOCIETY,
. . . . . , PA., . . , *188* .

This will certify that . was this day elected to represent this Society in the Pennsylvania Board of Agriculture, for the term of three years, commencing from and on the fourth Wednesday of January, 188 , and that the said Society was organized under, and has complied with, the provisions of the act of March 28, 1851.

. . . . , *President.*
. . . . , *Secretary.*

On behalf of the Committee on Forests and Forestry, Dr. Roland read a full and complete report, which was adopted, and the Secretary was directed to incorporate it in the next quarterly report of the Board.

Mr. PERRIN, on behalf of Committee on Freight Discrimination on Agricultural Products, presented a full report, which was accepted, and ordered printed in the proceedings of the Board.

On motion, Col. WALLACE, of Lawrence, read an essay on "Weeds and their Eradication," the subject matter of which was discussed by Messrs. Beebe, Wallace, Meehan, Keller, Garretson, Reeder, Leffmann, Musselman, Smith, Stitzel, Herr, McDowell, Eves, and Underwood.

On motion of Mr. MOORE, seconded by Mr. KELLER, adjourned until two, P. M.

At an adjourned session held Wednesday, May 24, 1882.

Board called to order at two, P. M., Vice President Hood in the chair.

Present—Messrs. Perrin, McKee, Sterling, Reeder, Dindinger, Herr, Eves, Hiester, Hood, McKnight, Wallace, Barnes, Smith, Foresman, Yeakle, Sechler, Shimer, Musselman, Keller, Vaughn, Tyler, Beebe, McDowell, Underwood, Roland, and Secretary.

On motion of Mr. KELLER, Mr. GARRETSON, of Adams, read an essay on "The Advantages and Disadvantages of Deep Plowing," which was discussed by Messrs. Eves, Barnes, Keller, Garretson, and Musselman.

On motion of Mr. MOORE, Mr. MUSSELMAN, of Somerset, read an essay on "Maple Sugar, its Cost and Profit," which was discussed by Messrs. Meehan, Musselman, Roland, Eves, Keller, Garretson, Barnes, Biery, Perrin, Beebe, and Secretary.

Mr. BARNES presented the following communication from the Lehigh County Agricultural Society:

Resolved, That the thanks of the Lehigh County Agricultural Society be and are hereby tendered to the State Board of Agriculture for the honor they have done us in selecting our county for the meeting of the Board, and that they are hereby cordially invited to visit places of interest in the neighborhood, in charge of the following committee of the agricultural society.

ENOS **ERDMAN**, *President.*
L. P. **HECKER**, *Secretary.*
E. P. **GRAM**, *Treasurer.*

Committee: V. L. Schrieber, R. A. Thayer, H. J. Schantz, R. E. Wright, L. A. Bridges, and W. F. Yeager.

On motion, the invitation was accepted, to take effect at a time most convenient to the committee.

On behalf of Mr. Soleliac, superintendent, Mr. **BARNES** invited the Board to visit the Adelaide silk-mill.

On motion of Mr. **BEEBE**, the invitation was accepted, and Mr. Barnes instructed to inform Mr. Soleliac that the Board would visit the mill in a body at the close of the present session.

On motion of Mr. **UNDERWOOD**, Mr. **BARNES** then read an essay on "Silk Culture," which was discussed by Meehan, Foresman, Barnes, and Roland.

Adjourned to meet at half past seven, P. M., Wednesday.

At an adjourned session held Wednesday evening, May 24, 1882.

Board called to order at eight, P. M., by Vice President **FORESMAN**, in the chair.

On motion of Dr. **ROLAND**, the reading of the minutes and calling of the roll were dispensed with.

By request, Dr. H. **LEFFMANN**, the Microscopist of the Board, then addressed the meeting on the "Modern Theories of Fermentation and Decay."

On motion, Prof. Thomas **MEEHAN** addressed the meeting on the subject of "Bark of Trees and its Functions."

After a full discussion of the subject-matter of both addresses, on motion, adjourned until eight o'clock, A. M., Thursday.

At an adjourned session of the Board, held Thursday morning, May 25, 1882.

Board called to order at eight forty-five, A. M., by Vice President **FORESMAN**, in the chair.

Present—Messrs. Perrin, Musselman, Roland, Leffmann, Dindinger, Eves, Beebe, Hiester, Barnes, Herr, Keller, Wallace, Foresman, Garretson, Meehan, Sterling, Sechler, Vaughn, McKnight, Underwood, Shimer, and Secretary.

On motion, an essay on "Ensilage," by Prof. W. H. **JORDAN**, Agricultural Chemist of the Board, was read by Col. **DEMMING**, and followed by a short essay on the same topic, by J. O. **SCHIMMELL**, of Philadelphia, both of which were discussed by Messrs. Beebe, Musselman, Underwood, Barnes, Wallace, and Secretary.

On motion, Mr. **HIESTER** read an essay on "Fruit Culture," which was discussed by Messrs. Roland, Hiester, Herr, Keller, Beebe, Musselman, Meehan, Barnes, Leffmann, Foresman, and Secretary.

An essay by Dr. J. P. **EDGE**, on "Commercial Fertilizers," was then read by Mr. **DEMMING**, and discussed by Messrs. Herr, Barnes, Sechler, Beebe, Garretson, Keller, Musselman, McAllister, and Secretary.

By request, Dr. Roland, of York, read an essay on "Agriculture and the Duties of County Agricultural Societies," which was discussed by Messrs. Herr, Barnes, and the Secretary.

On motion of Mr. **MUSSELMAN**, seconded by Mr. **GARRETSON**, a committee on "The Preservation of Useful Birds," was added to the list of standing committees, and the Chair named Messrs. Musselman, Jaekel, Barnes, Keller, Hiester, Engle, Shimer, and Oliver, as said committee, with power to add to their number as their chairman may elect.

Dr. **ROLAND**, of York, then presented the following from the committee in care of business, which was adopted by a standing vote:

Resolved, That the thanks of this Board are eminently due, and are hereby tendered, to the commissioners of Lehigh county for the use of the court-house in which the meetings of the Board have been held, and especially to the honorable court for relinquishing its right to the court-room, which had already been previously arranged for holding court sessions; to the honorable the mayor of the city of Allentown for the kind and expressive words of welcome extended in behalf of the citizens to the members of the board; to Mr. Soleliac for the invitation to visit the Adelaide silk-mill and the opportunity to witness the various operations through with silk passes before it is a finished fabric; to Dr. Barnes, our fellow member of the Board, for his energy and many acts of kindness in rendering our visit and meetings comfortable and convenient, and to the officers of the Lehigh County Agricultural Society for their friendly notice, as evidenced in their kind invitation to the members to enjoy their hospitality, visit the fair grounds, and other objects attractive and interesting, around the city.

On motion, adjourned to meet at Washington, Pa., October 18, 1882, at nine, A. M.

AUTUMN MEETING.

Held at Washington, Washington county, Pa., commencing Wednesday, October 18, 1882.

Board called to order at nine, A. M., by Vice President Dr. John P. Edge in the chair.

Present—Messrs. Atherton of Centre, Edge of Chester, Garrettson of Adams, Patterson of Armstrong, Moore of Berks, Reeder of Bucks, Hale of Centre, Herr of Clinton, Eves of Columbia, Barnes of Lehigh, Foresman of Lycoming, Smith of Luzerne, McKee of Mercer, Sechler of Montour, Shimer of Northampton, Musselman of Somerset, Keller of Schuylkill, Vaughan of Sullivan, Tyler of Susquehanna, Miller of Warren, Underwood of Wayne, Beebe of Venango, Roland of York, and Secretary.

Minutes of previous meeting read, and on motion of Mr. **KELLER** adopted.

On motion of Dr. **ROLAND**, Mr. McDowell, resident member from Washington, was made chairman of a committee to prepare a programme of work for the Board, and he was given full power to name his associates.

The **SECRETARY** announced the resignation of Mr. Hood, member from Indiana, and the election of Mr. Sutton as his successor, and that owing to Mr. Hood's resignation, there was a vacancy in the list of Vice Presidents of the Board.

On motion of Mr. **MUSSELMAN**, the Board proceeded to an election to fil the vacancy, and the Chair having named Messrs. Patterson and Barnes as tellers, Mr. Barnes nominated Dr. Roland. When on motion the nominations were closed, and Dr. Roland elected by acclamation.

The SECRETARY announced the receipt of a communication from Mr. Kemp, of Blair county, relating to timber and rainfall, which was, on motion, referred to the committee on Forests and Forestry, with directions to report it as early in the present sessions of the Board as possible.

The chairman of the committee to whom was referred the resolution relating to the establishment of an experimental station and the sale of the State experimental farms, announced that they were prepared to report, when at the suggestion of Mr. McDOWELL, chairman of Committee on Programme, Wednesday afternoon was fixed for its discussion.

Dr. EDGE offered a resolution relating to changes in the act forming the Board, which after discussion by Messrs. Keller, Roland, Reeder, Herr, Musselman, Underwood, Jordan, Atherton, Tyler, Barnes, and Secretary, was withdrawn.

On motion of Prof. ATHERTON, the question of "What constitutes a right to membership in the Board of Agriculture," was referred to the Committee on Legislation.

Mr. UNDERWOOD, on behalf of the Committee on Grass and Grasses of Pennsylvania, made a full and complete report of the work of the committee, which was ordered to be printed in the proceedings of the Board.

Hon. M. R. WISE offered the following:

WHEREAS, The House of Representatives of the United States nearly unanimously passed a bill making the United States Commissioner of Agriculture an executive officer: *And whereas*, Such bill is awaiting the action of the Senate to become a law; therefore,

Resolved, That the Board of Agriculture does hereby urge upon the Senate of the United States the passage of said bill, believing that it will give prestige and encouragement to the greatest industry of the country.

Which was, on motion, referred to a special committee, consisting of Messrs. Moore, Musselman, Tyler, Foresman, and Herr.

The Committee on Programme of Business made a partial report, as follows:

At two o'clock this afternoon, address of welcome by John Aiken, Esq., with reply on behalf of the Board by its presiding officer; report of the Committee on Establishment of Experimental Station and Sale of Experimental Farms; addresses by John M. Stockdale and John McDonald, with adjournment at six o'clock. Evening session to commence at half-past seven, and be occupied by addresses of Boyd Cumrine, Esq., Prof. W. H. Jordan, and Prof. H. Leffmann.

On motion adopted, and made the regular order of business for the day.

An invitation to visit the Washington College was received, accepted, and the time for the visit referred to the Committee on Programme of Business.

Essay of Mr. McDOWELL on "Sheep and their Habits," read, when after discussion of its subject-matter by Messrs. Oliver, Beebe, Herr, Jordan, Miller, Musselman, Foresman, Keller, and Archer, further discussion was postponed until the afternoon session.

On motion adjourned.

Board called to order at two, P. M., by Dr. J. P. EDGE in the chair.

On motion the reading of the minutes was dispensed with.

Mr. McDOWELL then introduced John Aiken, Esq., who addressed the Board as follows:

GENTLEMEN OF THE STATE BOARD OF AGRICULTURE: When a friend visits you, he will take it as a kindness if you will early tell him about your family, your house and farm, and all your surroundings, so that he may know how to adapt himself to the ways of your household, and to know how he may enjoy himself while there. I presume it was to meet some such feeling that a speaker was assigned to make an address of welcome, and if, in the discharge of the duty I should seem to go astray on matters of farming, you can take me as giving you the answer that Dr. Samuel Johnson gave to one of his lady friends. Shortly after his dictionary came out, she asked him, in great earnestness, how he came to define the word "pastern" as "the knee-joint of a horse." He replied promptly and brusquely, "Ignorance, madam—pure ignorance." And I assume that what the speaker may have to say should be short, but not too short. A minister once married a couple, and the man said: "Be short, be short," that is the way with the men here. The minister said: "Yes, I can do it in three minutes, but it will last longer than that." He saw there was some little dissatisfaction on the part of the woman, and said: "You don't want to have it too short?" "No," she said, "a body don't want to get herself up so for nothing."

But to start on the tack suggested a few moments ago, we can safely say we have a grand old county. The soil, in richness, is unsurpassed by that of any other county in the State, and unlike that in many other places, instead of losing strength as it ascends from valley to hill-top, it seems to gather strength as it goes up, and the crops on the crest are, if anything, better than those below. Under this soil is found a superior quality of limestone, and at many points building stone. Below this are three veins of coal, that are not surpassed in quality in the east or the west, and which now, though our mining interests are in their infancy, supply millions of bushels of fuel annually to the west and south. Beneath the coal is certainly an abundant supply of gas, and we trust time will show of oil, also.

An incident of many years ago may not prove amiss in showing up the good points of our county. It is said when Hon. T. M. T. McKennan was the member of this congressional district, then composed of this county, he and a number of the members were discussing the good qualities of the people and the land within their respective regions of country. After they had finished, a senator who had joined the group during, but who had taken no part in, the discussion, said that he had traveled widely, but he would have to yield the palm to Mr. McKennan. He had been in Washington county only once, and then to drive from Wheeling to Pittsburgh, by way of Washington borough; but two matters were impressed on his mind as he rode along, and led him to believe it was a good country. He saw water in nearly field, and at almost every cross-roads a church or a school-house.

Of the people I need say little. They are somewhat reserved; but under the ice runs a warm current of feeling. I advise you to say nothing against the Scotch-Irish. While, if this people should ever fall into idolatry, there would be a goodly number who would fall down and worship their Scotch-Irish lineage. While they have many good points they are given to being set in their ways, stubborn, if not, on some occasions, a little turbulent. They are disposed to not yield a position without a contest. It is said, a faithful minister, in the course of his pastoral visitation, tapped at the door of a house, where he could not be heard for the contention within, amounting almost to blows. After waiting a little, he opened the door, and in an authentative voice said, " I should like to know who is the head of this house." " Well, sir," said the husband and father, " if you sit down a bit we'll maybe be able to tell you, for we've just trying to settle that point."

But I am going too far. I must pass the first question upon which I intended to speak, viz: Why is it that Washington county cannot have manufactures near home, in Pennsylvania, to work up her annual production of three millions of pounds of wool, instead of sending it to Boston, New York, and other eastern cities, and shall touch, only, on another question of vital importance to every farmer's home, of which little is said.

In the "Annual Report of the Managers of the Western Pennsylvania Hospital for the Insane, at Dixmont," for each year, you will find that in the list of occupations of the female inmates farmers' wives, in point of numbers, stand near the head. While a partial reason for this may be found in the fact, that in our population in general farmers' wives form a large proportion, still the source of disorder is deeper. It is in the lives they lead at home on the farm. Like Martha of old, they are " cumbered about much serving."

Besides bearing and rearing a family of children, and going through the labor of washing, ironing, and mending, a large number do most of, and many do all the rest of their housework. From three to half a dozen cows are milked by each, the butter churned, and these with soap making, canning and preserving fruits, and the " thousand and one" other things that must be attended to, go to make up the wife's labor. And while the husband does his work with the latest improved style of machinery, the wife must struggle along as best she can, with few and defective (many of them worn out) tools. He must have his tool-house and tool chest, and the water running into the stable, but the wife secures a pantry after much tribulation, and for a score of years had no cistern, and is obliged to carry her wash-water a hundred yards or more. She is expected, too, with her weekly sales of " marketing," to buy the groceries, and clothe herself and the children. She is so occupied in running at the *heels* of her work — she can never get before it — from morning until night, that when evening comes, she is too tired to read, and if she *has* time and inclination, the material for reading is not supplied by the male head of the house. What is the result? Let politics, literature, or science be mentioned, and she is dumb. The husband, while he does not supply books and papers to the family, keeps himself afloat with the current events of the day, by being brought into frequent contact with his fellows on the road, in the village, at the election, at court, or at the political meeting. To the wife, no such opportunities are afforded. The outcome is disastrous. She loses her power over, and her influence with her children by her inability and lack of time to instruct, and instead of being the powerful factor that she should be in molding society through her children, she becomes an object of tender pity on the part of those she should be able to lead in all their ways.

But it does not end here. She crosses the dividing ridge between work days and rest days, either because she is broken down or because the family have secured such a place in society that it is not respectable for the wife to be a slave longer. Her work before this for many years has given her mind food to feed upon, and now that physical labor is gone, she has nothing to take its place. She cannot interest herself in reading, nor instructing her grand-children, nor in the many ways that the cultivated mind finds open before it. It feeds upon itself, and the result is, she sinks into insanity or imbecility at an age when she should be in the full exercise of her mental powers, and capable of wielding a powerful influence for good for many years. To the farmers here, I earnestly urge in this regard, the scriptural teachings: "If any provide not for his own, and specially for those of his own house, he hath denied the faith, and is worse than an infidel," and, "Likewise ye husbands, dwell with them according to knowledge, giving honor to the wife as unto the weaker vessel."

But I have trespassed too much on your time and patience. Gentlemen of the State Agricultural Society, I bid you a hearty welcome to our town and county, and trust that our meeting together may be of mutual benefit.

On behalf of the Board, Dr. J. P. Edge (acting President) replied as follows:

Mr. AIKEN AND CITIZENS OF WASHINGTON COUNTY: In responding to the generous words of welcome which you have just uttered, I feel embarrassed, from the fact that I stand in the place of the presiding officer of the Board, Governor Hoyt, and you will excuse me if I am brief. We come to you, citizens of Washington county, not as instructors, but for instruction. The fame of your methods in some special branches of agriculture is widespread, and we come to see and to talk with you about them. This Board does not lay claim especially to directing the operations of farmers, but rather to aid them, to some extent, by mingling together and comparing opinions. We desire, on all occasions, to have the farmers of the section in which we meet to take part with us actively in the proceedings. Agriculture, in one respect at least, is like the exact sciences in this: That what is known to one is known to all and every other one known to the profession, it is therefore desirable to have that free understanding in our meetings, and be all on the same footing. The programme of our exercises is evidence that we expect you to do the principal part of the talking, and by free discussion of the subjects that we have presented, have a better understanding of all the subjects the points discussed. In behalf of my fellow-members, I thank you for your kind greeting.

On behalf of the committee on sale of State experimental farms and the establishment of a State experimental station, Dr. Edge presented a full report. Prof. J. Y. MCKEE, on behalf of the same committee, presented a minority report, both of which were read, when, after discussion, Prof. ATHERTON offered the following: "*Resolved*, That the majority and minority reports on Mr. Beebe's resolution respecting an experiment station be re-committed, and the further consideration of them postponed;" adopted.

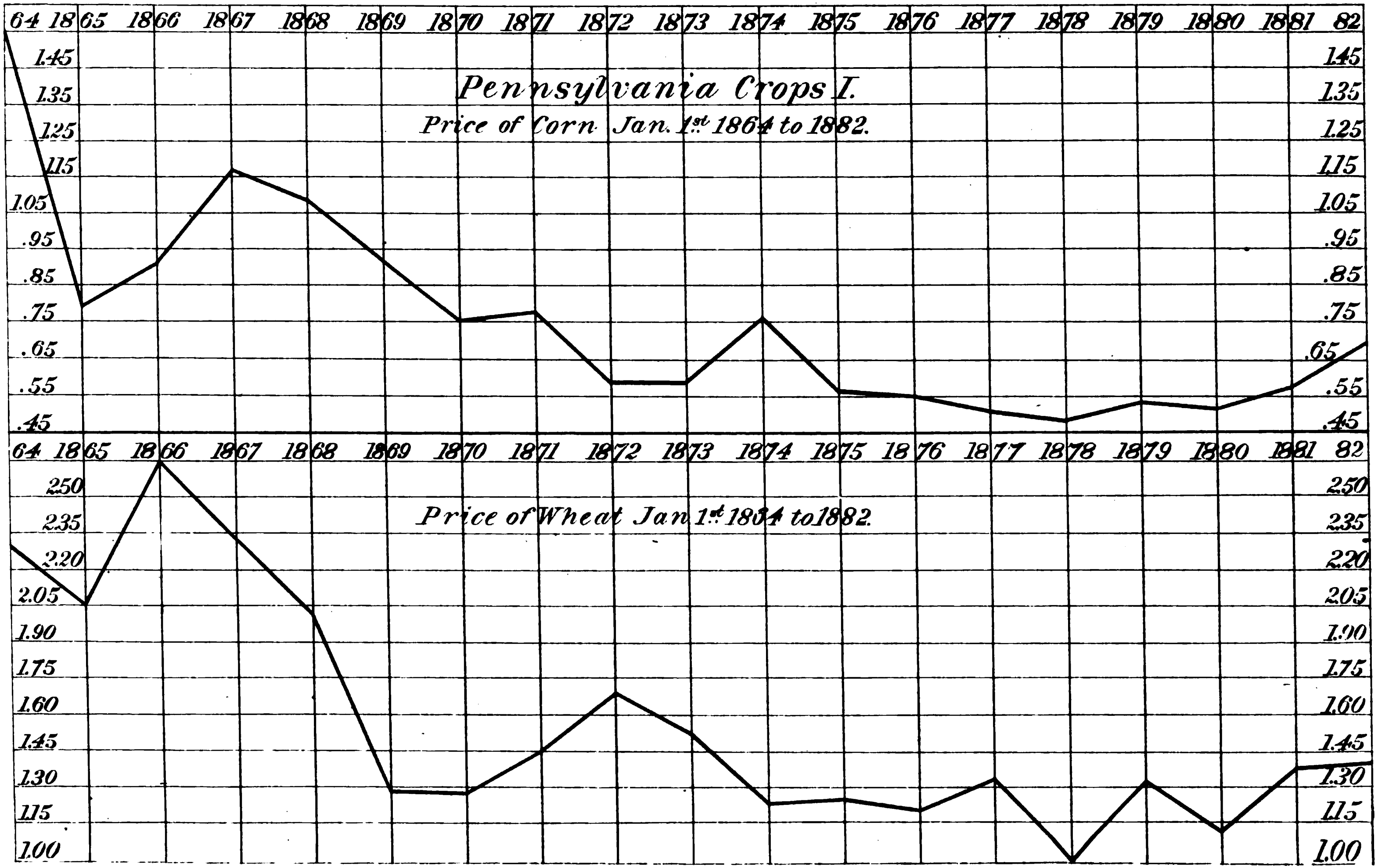
Prof. ATHERTON then offered the following: "*Resolved*, That in the judgment of this Board, it is highly important to the agricultural interests of this Commonwealth that a scientific experiment station be established at the earliest practicable time." Adopted unanimously.

On motion of Mr. EVES, the discussion of the subject-matter of Mr. McDowell's essay on "Sheep and their Habits" was resumed, and participated in by Messrs. Archer, Herr, Vaughn, Beebe, Anderson, Musselman, Oliver, and Secretary.

Mr. McDOWELL presented an invitation from the management of the Reform school at Morganza to visit that institution, which was, on motion of Mr. ROLAND, accepted and referred to Committee on Programme of Business.

[After the close of its sessions, a portion of the Board visited the Reform School at Morganza, and at an informal meeting, with D. H. Foresman in the chair, and Prof. G. W. Atherton, Secretary, the following resolutions were adopted:

Resolved, 1. That the thanks of the Board are hereby returned to Superintendent J. A. Quay, for his courtesy in giving them so full and satis-


Pennsylvania Crops I.
Price of Corn Jan. 1st 1864 to 1882.
Price of Wheat Jan 1st 1864 to 1882.
64 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 82
1.45
1.35
1.25
1.15
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.95
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.65
.55
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250
235
220
205
1.90
1.75
1.60
1.45
1.30
1.15
1.00

factory an opportunity to inspect the management and working of the institution under his charge.

2. That the Board hereby express their unqualified approval of the management of the Reform School, so far as their brief examination ena them to form a judgment, and warmly commend it to the support and confidence of the people of the State.

Mr. Archer invited the Board to examine his farm and flocks of thoroughbred sheep, which was, on motion, referred to a special committee of which Mr. McDowell was made chairman, with power to name his associates.

The Committee on Legislation presented the following: The Committee on Legislation, to whom was referred the question "What constitutes a membership in the Board," would respectfully suggest that the interest of the Board would be best subserved by referring the matter to a special committee.

Signed,
M. C. Beebe,
W. G. Moore,
C. C. Musselman,
U. F. Underwood.

Which was, on motion, adopted; the committee to be announced by the Chair at a subsequent session.

On motion, adjourned until seven, p. m.

Board called to order at seven, p. m., by Dr. Roland, Vice President, in the chair.

On motion, the reading of the minutes was dispensed with.

Credentials of Mr. Sutton, member elect from Indiana, were received, and on motion of the Secretary, accepted.

On motion, Prof. W. H. Jordan then addressed the Board on the subject "The Maintainance of Fertility."

Boyd Crumrine, Esq., addressed the Board on the subject of a "Better Life for the Farmer," and Prof. H. Leffmann on "Practical Hygienic Measures necessary to Prevent and Control Diseases of Live Stock."

On motion, adjourned.

Thursday Morning, *October 19.*

Board called to order at half past eight, a. m., by Vice President Roland in the chair.

Dr. Roland, on behalf of committee having charge of the communication of Mr. Kemp relating to "Forests and Rainfall," reported that as its substance had already appeared in the proceedings of the Board, the committee did not deem it advisable to recommend its publication at the present time.

On motion of the Secretary, the subject of the reports of county fairs was taken up, and after discussion by Messrs. Barnes, Roland, Beebe, Edge, and Foresman, the Secretary was made chairman of a committee to report a plan for such reports and given full power to name the other members of the committee.

Messrs. Barnes, Tyler, Foresman, Garrettson, and Oliver were named by the Chair as a special committee to define the rights of membership in the Board.

On motion, a committee on Wool and Textile Fabrics, with John McDowell as chairman, on Dairy and Dairy Products, with E. Reeder as chairman, and Cereal Crops, with D. H. Foresman as chairman, were added to the regular standing committees of the Board, and each chairman was given full authority to select members of his committee.

On motion, the plan for future meetings was taken up, and Messrs. Atherton, Roland, Beebe, Edge, Foresman, and Secretary made a committee to report to the annual meeting.

On motion, an essay on "Ice Houses for Farmers," by H. M. **Engle**, was read by Mr. Reeder.

On motion, adjourned.

Board met Thursday afternoon, October 19, in the lecture-room of the Washington and Jefferson College, to hear an address by Prof. **Linton** on "Parasites in Animals," and at the close of the address, adjourned to meet in the city hall.

Present—Messrs. Shimer, Hale, Musselman, Reeder, Vaughn, Edge, Smith, Leffmann, Miller, Herr, Patterson, Sechler, Beebe. Underwood, Sutton, Eves, McDowell, Tyler, Atherton, Garretson, Roland, Foresman, Oliver, and Barnes.

By request, **Alexander** M. Gow, Esq., read an essay on the "Relation of Schools to Domestic Economy."

On motion of Mr. **Tyler**, Mr. Reeder read an essay on "The Benefits and Disadvantages of Soiling Stock," and John W. Stockdale delivered an address on "The Relation of Agriculture to Other Pursuits."

The committee, to whom was assigned the duty of defining the right of membership in the Board, reported as follows:

"The committee, to whom was referred the duty of determining the rights of a membership in the Board, respectfully recommend the adoption of the following resolutions, viz:

1. That there shall be but one member of the Board from any county in the State.

2. That the county asking for representation in the Board must have an agricultural society, which shall raise a sum of money each and every year for the advancement of agriculture, and hold an annual agricultural exhibition, so as to be entitled to an annual bounty on the conditions prescribed by the acts of 1857 and 1876.

3. And further, we recommend that the Committee on Legislation be requested to secure an amendment to section one of the act of 1876, so as to more clearly define the rights to membership in the Board.

(Signed) J. P. **Barnes**,
Henry C. **Tyler**,
M. W. **Oliver**,
I. **Garretson**,
D. H. **Foresman**,
Committee."

On motion of Mr. **Beebe**, the first resolution was adopted unanimously.

On motion of the **Secretary**, the words "and hold an annual agricultural exhibition" were stricken from the second resolution, and the remainder adopted as read.

On motion of Dr. **Edge**, seconded by Mr. **Tyler**, the third resolution was laid on the table.

Mr. **Foresman** offered the following:

" *Resolved*, That so much of the evening session as may not be occupied with the regular order of business, be devoted to the discussion of the question of " How can the efficiency of the State Board of Agriculture be increased so as to make it most advantageous to the interests of practical and scientific agriculture." Which was, after discussion, referred to a special committee to be named by the Chair.

On motion, adjourned.

Board called to order at seven, P. M., by Secretary, and in the absence of the Vice President, Mr. **BARNES**, of Lehigh, was called to the chair.

Present—Messrs. Garretson, Edge, Hale, Eves, Oliver, Barnes, Sechler, Shimer, Musselman, Vaughn, Tyler, Miller, McDowell, Underwood, Patterson, Roland, Foresman, Reeder, Beebe, Herr, and Secretary.

On behalf of the Committee on Silk Culture, Dr. **EDGE** presented a report which, after reading, was directed to be placed on record in the annual report of the Board.

On behalf of the Committee on Resolutions, Mr. **BEEBE** presented the following:

" *Resolved*, That the thanks of the Board are hereby cordially returned to the citizens of this borough and county for the interest which they have manifested in making the sessions of the Board interesting and profitable; to the president of the Washington and Jefferson College and the heads of other institutions for their invitations and attentions; to the Local Committee of the County Agricultural Society for their attention to the convenience and comfort of our members, and especially to John McDowell, the resident member of the Board, for the zeal and energy with which he has labored to render our meetings agreeable to its members as well as conducive to the advancement of agriculturists in the State," which was, on motion of Mr. **HERR**, seconded by Mr. **TYLER**, adopted.

On motion, adjourned to meet at Harrisburg at the time fixed for the annual meeting.

EXTRACTS*

FROM THE

REPORT OF THE SECRETARY OF THE BOARD

As presented at the autumn meeting.

Membership in the Board.

During the past four or five years, a greatly increased interest in the work of our Board has been developed. This increase in interest has led to an increase of membership from twelve to fifty members. The determination of the rights of county agricultural societies to a representation in the Board, has caused much correspondence and the presentation of many questions, which have been decided as was deemed best for the interests of all parties concerned.

The act forming our Board, fixes the right of membership as follows:

"SECT. 1. *Be it enacted, &c.*, That the Governor of the Commonwealth, the Secretary of Internal Affairs, the Superintendent of Public Instruction, the Auditor General, the President of the Pennsylvania State College, and the person appointed from or by each agricultural society in the State entitled under existing laws to receive an annual bounty from the county, and three other persons appointed by the Governor, with the consent of the Senate, shall constitute the State Board of Agriculture."

The act authorizing the payment of bounties from the county, is as follows:

"When any number of individuals shall organize into an agricultural or horticultural society, or any agricultural or horticultural society now organized in any county in this Commonwealth, shall have adopted a constitution and by-laws for their government, elected officers, and raised annually, by voluntary contribution of its members, any sum of money which shall have been actually paid into its treasury, for the purpose of being disbursed for the promotion of agricultural knowledge and improvement, and that fact be attested by the affidavit of its president and treasurer, the said county society shall be entitled to receive annually a like sum from the treasury of the county: *Provided*, That said annual payment from the county funds shall not exceed one hundred dollars: *And provided*, That but one such society in any one county shall be entitled to receive such appropriation in any one year under this act."

A membership in the Board must be founded upon these two sections of law, and by a resolution of the Board the applicant for membership must present the following certificate, properly filled up and signed:

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* Owing to the press of office work, the usual autumn quarterly blanks were not sent out to our official correspondents until a month after the usual date. As a necessary consequence, our crop report and crop notes were not prepared in time to occupy their usual position in the report of the Secretary, but will be found in another portion of the volume.

OFFICE ——— COUNTY AGRICULTURAL SOCIETY,
————, PA., ————, *188* .

This will certify that ———— was this day elected to represent this society in the Pennsylvania Board of Agriculture, for the term of three years, commencing from and on the fourth Wednesday of January, 188 , and that the said society was organized under, and has complied with the provisions of the act of March 28, 1851.

————, *President.*
————, *Secretary.*

On presentation of this certificate at a meeting of the Board, it is referred to the committee on credentials, who make report to the Board as to its proper disposal, and the Board acts by a vote on the acceptance or rejection of the certificate.

A number of our counties have two, three, or even four county agricultural societies, and the application of more than one of these for membership in the Board, has led to frequent disputes and in some cases to one or more law suits between the county commissioners and county agricultural societies. When such claims have been referred to this office for decision, your Secretary has referred the applicants to our statute law, and has claimed that the county commissioners or county treasurer must decide which society is " entitled " to the bounty, and this point having been decided, the Board will accept the representative of that society.

While we admit that, within certain fixed laws, the Board is a judge of its own membership, yet we have at the same time assumed that it is no part or portion of our duties to decide which county agricultural society is entitled to a disputed bounty. The act above quoted as regulating the payment of bounties to county societies, would seem clearly to provide that the bounty can be paid to but one such society in any one year, and the county officers having decided this point by paying it to one of the several claimants, practically remove the decision from the Board.

In view of these differences of opinion, which will no doubt come up for our consideration, I would suggest the propriety of a modification of the act granting these annual bounties from the county treasurers, or at least the formation of an amendment which shall make the meaning more plain, and thus remove the whole cause of difficulty.

The membership in our Board has probably now reached its maximum, but a number of counties are still not represented. This arises from two causes: In some cases the county has no agricultural society within its limits, and in others the existing society draws no bounty. In view of the greatly increased membership, and the small amount now appropriated for expenses, I would suggest the importance of either a modification of the act regulating membership, or an increase in the amount annually appropriated for your expenses. When the present appropriation was given, the membership was but twenty-seven, and the sum was sufficient; but with the present ratio it is insufficient, and, to a certain extent, cripples the Board by decreasing its ability to work.

County Agricultural Societies.

Our official list shows that in addition to over seven hundred and fifty granges, farm clubs, and similar organizations, we have in existence one hundred and two county agricultural societies. A few of our counties are without such an organization, a number have two, some have three, and a few have four active organizations. Of the total number, forty own the grounds on which their exhibitions are held, and fifty-eight hold their exhibition grounds by leases, varying in length from an annual one to one for ninety-nine years. Sixty are founded upon stock sold at the time of organization and thirty-eight are on the "mutual plan." In the former, the stock is usually sold at the time of organization, at a fixed par value per share, and instead of a fixed annual dividend or interest upon his outlay, the stockholder receives tickets admitting himself and others to all regular fairs, upon terms which have nearly as many forms as there are societies. In a few cases, the stockholder's ticket admits himself, all female members of his family, and all male members not over eighteen years of age; and also admits his carriage and team at all times, and gives him the right to exhibit without the payment of the usual exhibition or entrance fee. In other cases, the stockholder annually receives a ticket, which admits himself to all fairs, and to which one or more coupons are attached, and which will pass any one whom he may elect to accompany him. The number of these coupons vary with the liberality of the board of managers, ranging from one to six. In a few cases, the stockholder's ticket only admits himself and carriage. In many cases, the stock was sold with the distinct understanding that it carried with it certain privileges, in the shape of admissions to the fairs, and in come cases, where the society had issued all or nearly all the stock allowed by its charter, its certificates have commanded a premium, on account of the admission privileges which they conveyed. In many cases, these original privileges have been so extensive and liberal as to involve the society in serious pecuniary difficulty, on account of so many comparatively free admissions. Cases have come under the observation of the writer wherein stockholders, owing to the liberality of the original bargain, have obtained, in the form of admittance to fairs, from fifty to seventy-five per cent. upon their investment annually. From a business point of view, this is clearly a rate of interest which no ordinary society can stand, or if it does afford the rate, can only do so at the expense of the single entrance tickets. On account of this and other difficulties, the habit of issuing stockholders' tickets, with a given number of coupons attached, is growing into favor, and a number of societies each year adopt it. In these cases, the body of the ticket admits the stockholder and his carriage, and each coupon is good for a single admission. It is hardly to be expected that an agricultural society can pay even fifty per cent. (though paid in admissions only) upon a very large proportion of its funds, nor is it just for the stockholders to expect or demand it. With the single admission ticket at fifty cents, the holder of stock soon obtains his original investment again. Another defect of the plan alluded to is, that the holder of ten shares obtains no greater benefits than the holder of one, and the stockholder with no family obtains a very low rate of interest when compared with one having a large family. To fullfil the ends of strict justice, each share of stock should convey precisely the same benefits to its holder, regardless of the size of his family or position. For this reason the coupon plan is much the more just, but even this also falls short of exact justice, inasmuch as the tickets have no reference to the number of shares the holder may have purchased, one share still enjoying as extensive benefits as five or more. The plan of starting a society upon a stock basis is a good one, for it gives the organization a fair sum of money just at a time when it most needs it, but the most simple, fair, and just way, would be to give as an interest upon the investment a fixed number of ordinary single admission tickets, even to the extent of fifteen or twenty per cent. of his money, and allow the stockholder to dispose of them as he may think best. This plan brings the whole matter down to a business basis, on which there is no room for a misunderstanding of terms.

Another form of organization quite popular in some portions of the State, is to issue what might be termed a member's ticket for a fixed amount, payable annually, with the proviso that the holder is to have certain privileges in the form of admissions to the fairs, and to have the full rights of a member at all elections and business meetings of the society. In most cases, the price of these tickets is one dollar, and they give the holder privileges varying (like the stockholder's ticket) with the liberality of the board of managers. So far as our data go, societies organized upon this plan, (if the terms have not been made more liberal than sound business tact would dictate,) are much more successful in a pecuniary point of view, than those organized upon a stock basis. In some cases a combination of the two forms has been tried, but have not given general satisfaction. Under all of these plans the boards of managers complain of imposition by the improper use of stockholders', members', and season tickets; the only way to avoid this is to issue but one form of ticket, viz: that of a single admission only, to be left with the gate-keeper at each passage through the gate. If the stockholder is entitled to privileges, (and he certainly is,) give him whatever number of single tickets, *per share of stock*, the organization can afford; if season tickets at reduced rates are needed, sell the single tickets in sheets of from five to ten, one to be left at each passage through thegate. To prevent irresponsible or improper parties from purchasing at wholesale rates and selling out at retail, the tickets sold at the reduced price may be issued in sheet form, only to be detached by the gate-keeper. By this plan, every one passing through the gate deposits exactly the same form of ticket and the now too-common fraudulent practices so much complained of by managers are effectually prevented.

Ensilage.

As indicated in our last annual report, the subject of ensilage has occupied its due share of the investigation of the Board during the past year, and an attempt has been made to sum up the matter collected during the past as well as former years in a paper which appears in another portion of this volume, where the result of correspondence, investigations, practical tests, analyses, effects of feeding, and the general economy of the process, are placed in a position on which the practical reader will judge for himself as to the expediency of adopting this plan of preserving feed for stock. In the article alluded to the Secretary has gone somewhat into detail, more so than is perhaps agreeable to the general reader; but our correspondence has demonstrated that many into whose hands this report will come are not well posted in either the history or modes of the process, and, to such, these minor items are important.

As will be noticed by a perusal of the paper alluded to, ensilage, like all other new processes in agriculture, suffers by too strong claims on the part of its friends. In many cases such information does almost as much harm as a positive failure. Many of our more practical readers will at once note that some of advocates of the system make claims for it, which, if correct, would indicate that the fodder, during its conversion into ensilage underwent some mysterious change which greatly enhanced its feeding value. On the other hand all scientific evidence proves conclusively that the process must necessarily be attended with more or less wast of good material. Our reports and correspondence vary all the way for that of an enthusiast to the reported failure of the practical man, and it is to be regretted that our space will not permit of our publishing more of the evidence at hand.

In the publication of the result, we have, in great measure, excluded evidence tending to prove that stock will not only consume the food but will also milk well and thrive on it. We regard this issue as settled by the evidence of a large number of practical men who have given the system a trial, and that hence the examination should be mainly confined to two points, viz: 1. Is the plan an economical one, and, 2, are the resulting products improved by this kind of food.

The drawbacks to the more general adoption of the system are that it involves the handling of an immense amount of material, of which fully ninety per cent is water, at a season of the year when other farm work is pressing, and when a week or ten days' time is a very important integer in future success. If it is once demonstrated that the plan is economical, the cost of silos, cutters, &c., need not be taken into consideration, as they will then become permanent investments. It is evident that the most that can properly be claimed for the plan is, that it enables the farmer to utilize a large amount of green fodder, and convert into food that which could not otherwise be saved; but if the same amount of expenditure in money and labor would have produced as great a food value in some more convenient form, (as is claimed by the opponents of the system,) then even this claim must be given up.

After carefully summing up the whole of the evidence at hand, we incline to the opinion that the whole ground was well covered by Professor Jordan, when he writes:

"One thing is certain, viz: Nothing came out of the silo that was of value that did not go in in an equally valuable form. It is quite absurd, with our present state of knowledge, to claim that green corn-fodder increases in value by being allowed to lie in a large mass and undergo a partial decomposition. It may be safely affirmed that to the extent that such decomposition goes on with any cattle food, to that extent is its capacity decreased for running or building up the animal machine. Careful investigation has also shown that fermented fodder has not an increased digestibility over unfermented, neither is there much reason why we should expect such a result. The experience of many years shows that ensilage is not a necessity for securing the healthfulness or vigor of animals, for a variety of food can be obtained more cheaply in other ways. Then why all this excitement over silos, and why call an 'ensilage congress' any more than a 'cotton seed meal' congress? Certainly the farmer who preserves grass in silos, and so handles three tons of water several times in order to feed his cattle one ton of dry substance, has lost his judgment, for grass can be cured to perfection by the old-fashioned method."

With the opinions of such men as Professors Lawes, Cook, Genth, and Jordan before us, and the memories of cooked food, sugar beets, and other processes of the past, we have advised our practical correspondents who have applied for advice, to go slow, and if they do construct silos to so locate them that they will do for cisterns or root cellars if not needed for their original purpose.

By these remarks we have no intention of denying that ensilage as a food possesses certain advantages for which ordinary foods are not substitutes, but, to our mind, the whole subject must come down to the Yankee question of "Will it pay?" No one doubts that steamed hay or fodder will make more flesh, milk, and growth than unsteamed food, but we think the results of the past (in our own case, at least) clearly proves that the increased gain will not pay for the increased labor and expense. Roots will make both milk and beef, but the evidence of the past prove that for this purpose they cannot successfully compete with hay, fodder, and corn-meal. Sooner or later, our practical farmers will give us their verdict, from which there is no appeal, and we hazard the assertion that ten years hence, ensilage will occupy the same position as steamed food now does—a good thing which would not pay cost.

Several of our correspondents having raised a doubt as to the effect of ensilage upon the products of the dairy, and the argument being finally settled down to the theory that all depended upon the character of the acid developed during the process, it seemed to be the general opinion that if acetic acid and alcohol were formed, the result must prove deleterious to the milk and butter. To settle this question, Dr. F. A. Genth kindly agreed to make a careful analysis at his own expense. The result of this test is given elsewhere. The evidence of Professor Jordan is also given, as tending to support the result obtained by Professor Genth.

Farm Wages and Farm Labor.

In the collection of statistics relative to wages paid on the farm, we have kept two general plans in view, viz: Work *with* board, and work *without* board. Each of these we have again divided into three classes.

WORK WITH BOARD.

1. By the month where work is given during the whole year.
2. By the month where work is only given during eight or nine summer months.
3. By the day where work is only found during busy seasons, (other than harvest,) or at work not in the regular line of farm labor, including fencing, wood cutting, &c.

WORK WITHOUT BOARD.

1. By the month during the whole year.
2. By the month during summer months only.
3. Work by the day, the laborer boarding himself.

On nearly all farms at least one man is kept during the whole year, and even where but a single hand is employed, and he only for the summer months, the total amount of wages paid him will vary very little from that paid for services during the whole year. As a rule, the best farm hands refuse to hire for a shorter term of service than the whole year, as they find that the board in winter absorbs the surplus of the summer.

During the past six years the *average* wages per month, with board, has been as follows:

	Whole year.	*Summer months.*
1877,	$12 39	$15 10
1878,	11 24	14 05
1879,	10 58	13 40
1880,	11 97	14 90
1881,	12 45	15 49
1882,	13 70	17 04

During the past year Allegheny, Beaver, Blair, Bradford, Butler, Cambria, Cameron, Chester, Clearfield, Crawford, Delaware, Elk, Erie, Forest, Jefferson, Lackawanna, Luzerne, Lycoming, McKean, Mercer, Montgomery, Philadelphia, Potter, Schuylkill, Tioga, Washington, Westmoreland, and Wyoming have paid more than the average for hands hired for the whole year with board. The highest rates reported are in Allegheny, Elk, Lackawanna, and Philadelphia. In Allegheny and Philadelphia, this high rate is always reported, and is due to the close proximity of a large city which furnishes good wages at work involving less hard labor; in a number of other counties the lumber, coal, and oil interest absorb much of the floating labor, and cause higher rates for agriculture labor.

Our official reporters state that they find much difficulty in filling the blank for "Estimated cost of board per day" satisfactorily, but the blanks as sent in from each county do not show any more variation than do those for the different rates of farm wages.

During the past six years the average estimated cost of board of farm hands per day, has been as follows:

1877,	$0 35	1880,	$0 30
1878,	38	1881,	40
1879,	32	1882,	41

This year the estimate varies from fifty-one cents in Philadelphia, (outside the city proper,) to thirty cents in Perry. The average has been very nearly given from Adams, Butler, Cameron, Elk, Lawrence, McKean, Montgomery, Schuylkill, Sullivan, Warren, and Wyoming. This rate of $2 87 per week may then be assumed to be the average cost of boarding a farm hand during the year, or at the rate of about $150 per year. During the present season the rate of wages per year *with board* has been $164 40; the rate *without board* has been $204 48, showing an allowance of but $40 for the year's board. As an offset to this difference, ($120,) the farmer has the many "chores" done out of work hours, which in most instances will more than make the account even at the year's end.

A number of our reporters state that few men are hired to board themselves, yet we note a growing tendency to adopt this plan for at least a portion of the farm help, especially in sections where good house help is scarce. In some locations the remedy is found by having the work of the farm done for a share of the crops instead of a money payment.

The average rate of wages paid men who board themselves has (for six years) been $19 10 per month for the whole year, and $23 37 for nine summer months. For each year the average has been as follows:

	Whole year.	*Summer months.*
1877,	$20 97	$26 07
1878,	18 41	24 07
1879,	17 44	21 25
1880,	18 32	22 35
1881,	20 08	23 00
1882,	19 43	23 47

Here we may again note the discrepancy between the actual difference made where the laborer boards himself and the estimated cost of board per day or week.

In many cases the rate of wages, instead of being fixed by the month, is guaged at a fixed price per day, with work varying from every day to fair days only. In some cases the laborer boards himself, and in others the employer boards him. The average wages per day paid for this kind of labor during the past six years, has been as follows:

	With board.	*Without board.*
1877,	$0 80	$1 15
1878,	75	95
1879,	63	88
1880,	71	98
1881,	70	1 01
1882,	75	97

During the past year the average rate has been exceeded in Clarion, Clearfield, Clinton, Erie, Lycoming, McKean, Mercer, Montgomery, Northampton, Philadelphia, Pike, Potter, Schuylkill, Sullivan, Susquehanna, Warren, Wayne, Westmoreland, Wyoming, and York.

For the season of 1882, the rate of harvest wages per day has ranged from $2 50 in Allegheny, Butler, Cameron, and Philadelphia, to $1 34 in Cumberland, Dauphin, Juniata, Mifflin, Perry, and Union. The average of the whole State was $1 80, and was exceeded in Allegheny, Armstrong, Bradford, Bucks, Butler, Cambria, Cameron, Chester, Clearfield, Clinton, Crawford, Delaware, Elk, Erie, Forest, Jefferson, Lancaster, Lawrence, McKean, Monroe, Philadelphia, Westmoreland, and York.

A number of our reports note the fact that really first-class farm hands who can and *will* unite brain and muscle in the interest of their employer, are scarce and in demand, at wages considerably above the rates named in the reports; on the other hand, it is noted that the market is over-stocked with second and third class laborers, whose main motive is to put in the time regardless of the result. There is, undoubtedly, an open field and good wages for the better class of farm laborers, such as can oversee the work of the farm and lay it out a week or more in advance, and as such men can make more money working a farm on the shares, the vacancy will probably remain unfilled.

Commercial Fertilizers.

From the best evidence available, we estimate the annual consumption of commercial fertilizers in Pennsylvania at seventy thousand tons, or at the rate of about one third of a ton to each farm; at an average price of thirty dollars per ton, the aggregate cost is $2,100,000.

Those who have not followed up this branch of trade have but little idea of the rapidity of this increase. Twenty-five years ago the farmer who made use of this class of manure was the exception. Now, in eastern Pennsylvania the farmer who does not use more or less every year is the exception, and while the ratio of consumption is greatest in the counties of Bucks, Berks, Chester, Montgomery, Lancaster, and Delaware, yet their use is rapidly extending in nearly all of the counties of the State.

This increase in consumption is in part due to an increased confidence in the honesty of the manufacturer, and in part to the fact that as an investment a good fertilizer pays. If, by the use of fifty dollars worth of fertilizer, the farmer can obtain an increase of seventy-five dollars in crop value he has a powerful argument in favor of the practice. There can be no doubt that in many cases the ratio of profit is even greater than this, and the writer has repeatedly made use of bone where the increase in the first crop nearly or quite paid the whole cost of the application. Another course which may be partially credited will this increase is that the average farmer now knows more of the manufacture of fertilizers, and is thus more on an equality with the manufacturer. Twenty years ago the analysis, as now branded on the packages, was as so much Greek to the average consumer. Now the consumer knows that he wants phosphoric acid, ammonia, and potash, and his experience proves that the guarantee of a reliable manufacturer will give it to him if he is willing to pay a fair price for it.

Each year our farmers are learning more and more of their wants and needs in this direction, and are learning to look more at quality (when backed by a reliable guarantee) than price. Twenty years ago the farmer, in some measure, bought his fertilizer by guess, or as a hit-or-miss-sort of a style, which is rapidly giving way to the more enlightened plan of buying, as near as possible, what his land needs.

One of the greatest drawbacks to the increased consumption of fertilizers in some portions of our State is the mistaken demand for low-priced goods, and too many of the consumers will buy five tons at ten dollars per ton rather than one ton at fifty dollars, thus, in most cases, mistaking bulk for quality, for it may be assumed, as a rule, that the profit to the manufacturer is greater in the low priced articles. Manufacturers, in defense of what they know to be an injurious practice and which hurts the future trade, assert that the consumer wants these "cheap" goods, and that if the one manufacturer does not supply them another will do so, and it is to supply this demand and compete in the market that some of our most reliable manufacturers, unwilling to lower the grade of their *standard* goods, have placed in the market brands which can be sold at lower prices, and, on which, in a majority of cases, they have more profit.

It is useless to discuss the topic upon the principle of ascertaining who is to blame for this condition of the trade, but we must admit that it does exist, and try to find some means by which to correct this evil. If the consumer will buy only by *guaranteed analyses*, and of reliable parties only, the evil will soon correct itself. Then the consumer will soon learn (as the English farmer has already done) that the price is not *the* material issue, but that quality is also an important integer in the problem. The price per ton is not important if the analysis gives an *equivalent* value; in fact, if the analysis gives the equivalent, the higher the price (within certain limits) the better for the purchaser. That is, one ton of an article yielding thirty per cent. of available phosphoric acid, at a cost of $60 per ton, is relatively cheaper than three tons of a ten per cent. article at $20 per ton, for the consumer saves two thirds of the freight, hauling, and handling. When the manufacturer buys a lot of material for his goods he buys upon a guaranteed analysis that the goods will contain a fixed percentage of the exact material or ingredient which he wants, and the price is guaged at so much per centum "or unit," if the goods do not come up to the guarantee, the bargain is off or the price per ton is reduced. When the consumer can buy, in the same way, the grade of the goods, and the condition of the trade will improve rapidly. Any reliable maker will sell his goods on a guarantee, and the analysis forms a guage for the actual value of the goods. If we are right, the remedy then is to buy only of reliable parties, and of them only on a guaranteed analysis.

Another change to be noticed in the trade is the absence of the old-fashioned certificates of results attained by those who have used the article. These have ceased to have the former value with the consumer, and the dealers have, in great measure, given them up. In many (if not most) cases they were no doubt honestly given, but it is now well known that the result of one year in one season, with one crop, is valueless in establishing the merits of any article. A fertilizer may produce certain results this season, but the same article (just as good in its component parts) may utterly fail next year—all owing to a difference in season, and not due to any change in the composition of the fertilizer. The fact is, the consumer is now buying more on the analyses and business standing of the manufacturer than he used to, and to have a good standing is each year growing more and more valuable to the manufacturer; hence we find manufacturers very jealous of the grade of their standard brands, and very careless of the effect of ground limestone and cheap manures, in the market, and as a result we find that while new candidates for public favor, sold at a low price, come up each year, yet they are only known for a short time, while the analysis of standard goods is the same as formerly, with greatly increased sales. In all trades there are those who will purchase low-priced goods simply because they are low-priced, but this does not materially affect the progress of the trade in the line of better goods at fair prices.

We cannot better illustrate the condition of the trade in some parts of the State, and the condition of which we complain and wish so much to remedy, than to use the following, based upon our own observation. A large manufacturer of fertilizers pointed out to us four bags of bone standing in his warehouse. "There," says he, "are four grades of ground bone; the first two I will guarantee under any penalty; we brand them as pure; we sell them under our firm name as pure, and make a very small profit on them; the other two are not pure, and we tell the consumer so, but at the same time we tell him that the ingredients added are valuable as a fertilizer. Without asking the amount of the adulteration or the percentage of lower priced-matter added, the consumer will, in very many instances, take the lower grade at a lower price, and yet at a price which yields me a greater profit." If our Board can direct its best efforts towards correcting this evil, it will have done the farmers of the State much good, and will, at the same time, do much to raise the grade of the *average* fertilizer now in the market. The standard articles will take care of themselves, for in their make-up and sale the credit of reliable men is at stake, but the difficulty is with the low-grade goods which a mistaken policy, on the part of the consumer, now demands.

In connection with the use of commercial fertilizers, there is one other point which demands attention at our hands. The growing demand for acidulated South Carolina rock naturally raised the question of the importance of a complete manure. It is agreed on all sides of the controversy that phosphoric acid, ammonia, and potash are the three essentials needed by the *average* soil, and these are now made the component and leading parts of what may be termed complete manures. If the crop obtains these elements, (and it must have them,) it must get them from the soil, air, or fertilizer applied. If by the application of a fertilizer containing one of these elements only we increase the crop, the extra portion of the other two consumed by that crop must have come from the soil. Thus, if by the application of dissolved South Carolina rock (which contains phosphoric acid only) we increase the crop, the potash of the increase must have come from the soil, and the ammonia from the soil or air. Is it not then possible that these "incomplete" fertilizers may partake more of the nature of stimulants than of manures? To illustrate more plainly, let us take the example of lime. Lime is not a manure, but increases the crop by enabling it to appropriate certain elements in the soil, which were otherwise inert. The continued application of lime will, sooner or later, exhaust these elements and impoverish the soil, thus showing an action very similar to that of stimulants upon the animal kingdom. Is it not possible that the continued application of phosphoric acid alone may in time exhaust the supply of other elements absolutely necessary, and then in the end exhaust our soils? We do not assert that either theory or practice (with dissolved South Carolina rock) proves our point, but we raise the question for consideration, well knowing that in the case of similar single element applications *this has been the result.*

Analyses of Commercial Fertilizers.

Since the passage of the act of June 28, 1879, (to regulate the manufacture and sale of commercial fertilizers,) our chemist has analyzed nearly three hundred samples, selected from all portions of the State by parties not in any way interested in the manufacture of this class of goods. In all cases, before an analyses has been made, the identity of the sample has been established by the affidavit of the party making the selection, placed in file in the office of the Board. When it was practicable, an agent of the

Board was named for a neighborhood or locality, but in many instances, in order that the samples might properly represent the fertilizers of the whole State, they have been accepted from responsible and disinterested parties not directly named by the Board.

The result of these analyses, in tabulated form, has been circulated among the farmers and manufacturers of the State as follows: fifteen thousand copies in our annual reports, four thousand copies in our quarterly reports, and two thousand copies in ordinary circular form. Even this supply has fallen far short of filling the demand, and we have had to refuse a large number of applicants each quarter. In a number of cases, manufacturers have, at their own expense. ordered large numbers printed, and have circulated them, as an advertising medium, among their customers. Including all of these modes of circulation, it is safe to assume that not less than twenty-five thousand copies have been sent out during the past year. A number of applicants have asked that the whole three hundred analyses should be printed in tabulated form for general circulation. In view of the fact that since the earlier analyses were made, the grade of several of the brands has been raised, and the quality of the goods much improved, it has not been deemed best to accede to this request, the Secretary believing that it was the duty of the Board to protect not only the interest of the consumer, but that of the manufacturer also.

Most of our reliable dealers, and nearly all of our correspondents, admit that the effect of the law has been good, and that its natural result will be to raise the average value of the fertilizers of the State, not only by exposing fraudulent goods, but also by raising the grade of those which the test has proven were worth the money asked for them. A few, however, still propound the old question: "Is analysis a safe guard by which to estimate the value of a fertilizer?" To those we reply, that if analysis is not a safe guide, we have none upon which we can depend, for past experience has clearly proven that experiment is not a safe guide. The fertilizer which has in times past given the best results on the State experimental farms, fails to produce the best effect on the farm of the writer. The fertilizer which gives good results this year may, though made under the same formula, fail next year or year after.

The width of a public road will sometimes alter the character of the soil. A difference of a few weeks in the season, may turn the effect from the side of profit to that of loss. Experiment has proven that ground bone will in all cases give good results. That in many cases accidulated South Carolina rock may be applied with good effect. That in nearly all cases our standard brands of fertilizers will, during a term of years, give satisfaction, but in all of these cases the result of experiment are supplemented by the evidence of an analysis. Ground limestone, and other low-priced goods have failed to meet the test of the chemist's analyses, and they also fail under the test of the soil and crops. A fertilizer is valuable to the farmer for what it can furnish to the crop; analysis will show just what it does contain, and no other test will do so.

The chemist, as well as the consumer, has decided that phosphoric acid, potash, and ammonia are the three leading elements needed, and analyses will show whether they are present, and if so, in what amounts. Manufacturers tacitly admit the value of analyses, because they buy all their fertilizing supplies by analyses; if they need ammoniacal material they buy it for the ammonia, in an available form, which it will yield, and the price paid for it is gauged exactly by the proportion of this element. The price per "unit" (per cent.) may and does vary with the state of the market, but nevertheless if the goods are sold at a fixed price per ton, they are guaranteed to yield a certain number of units of nitrogen or its equivalent in ammonia. It has been suggested that ammonia may be added to a fertilizer, but in a form in which it is not available to plants; that while ground "leather scrap" contains a fair amount of nitrogen which, if the material be added to a fertilizer, will be shown in the chemist's analyses, but which cannot be appropriated by the crops, and hence adds in value, but gives no equivalent effect. Our answer to this is, that the nitrogen, (ammonia,) as given by reliable chemists, is in an "available" form. The nitrogen of leather scrap is not in an available form, and any good chemist will know whether the nitrogen (ammonia) in any fertilizer is derived from leather scrap or not. It is possible that leather scrap may be used, as has been asserted; but if so, we feel very safe in asserting that if Dr. Genth has found it, (which we very much doubt,) its nitrogen did not go into the valuation as "available" ammonia.

Some correspondence has passed between manufacturers and your Secretary, relating to the valuation of the component parts (phosphoric acid, potash, and nitrogen) of a fertilizer, and these manufacturers have in some cases objected to Prof. Genth's valuation of seventeen and a half cents per pound on available ammonia. A few object to the whole system of "valuation," because the prices or value of articles which they use for the purpose of supplying this ammonia are constantly varying, and that the prices vary in different parts of the same season or in different seasons, subject to changes caused by the relation of supply to demand. These facts are not denied, but we must still hold that they do not effect the end sought after in these valuations. The valuation is for comparison mainly, though care has been taken to fix the price as nearly as possible at the rate warranted by the then prevailing market price, and if the price of acidulated phosphoric acid, potash, or nitrogen has advanced or fallen since the rate per pound was fixed, it does not affect the analyses or valuation of a given number of manures as a means of comparison.

Suppose, for example, we go through our whole number of analyses as published in our list for October, and increase or lessen the price of ammonia, it would affect the result for comparison so far as ammoniacal fertilizers were concerned, and would in nowise affect the others. Nor do we note that the variation of value in any one kind of material is so great in any one season to greatly affect the *comparative* valuation of our list.

Others have claimed that the value of nitrogen (even as available ammonia) depends in some measure upon the source from which it was derived. To obviate this difficulty, the Connecticut experiment station has adopted the following scale of prices for nitrogen, phosphoric acid, and potash in their different forms:

Nitrogen in nitrates,	26	28
" in ammonia salts,	22½	29
" in Peruvian guano, fine steamed bone, dried and fine ground blood, meat and fish, super-phosphates and special manures,	20	24
" in coarse or moist blood, meat, or tankage, in cotton seed, linseed, and castor pomace,	16	18
" in fine ground bone, horn, and wood dust,	15	17
" in fine medium bone,	14	15
" in medium bone,	13	14
" in coarse, medium bone,	12	13
" in coarse bone, horn shavings, hair, and fish scrap,	11	11
Phosphoric acid, soluble in water,	12½	12½
" " "reverted," and in Peruvian guano,	9	9
" " insoluble, in fine bone, fish guano, and super-phosphates,	6	6
" " insoluble in fine medium bone,	5½	5½
" " insoluble in medium bone,	5	5

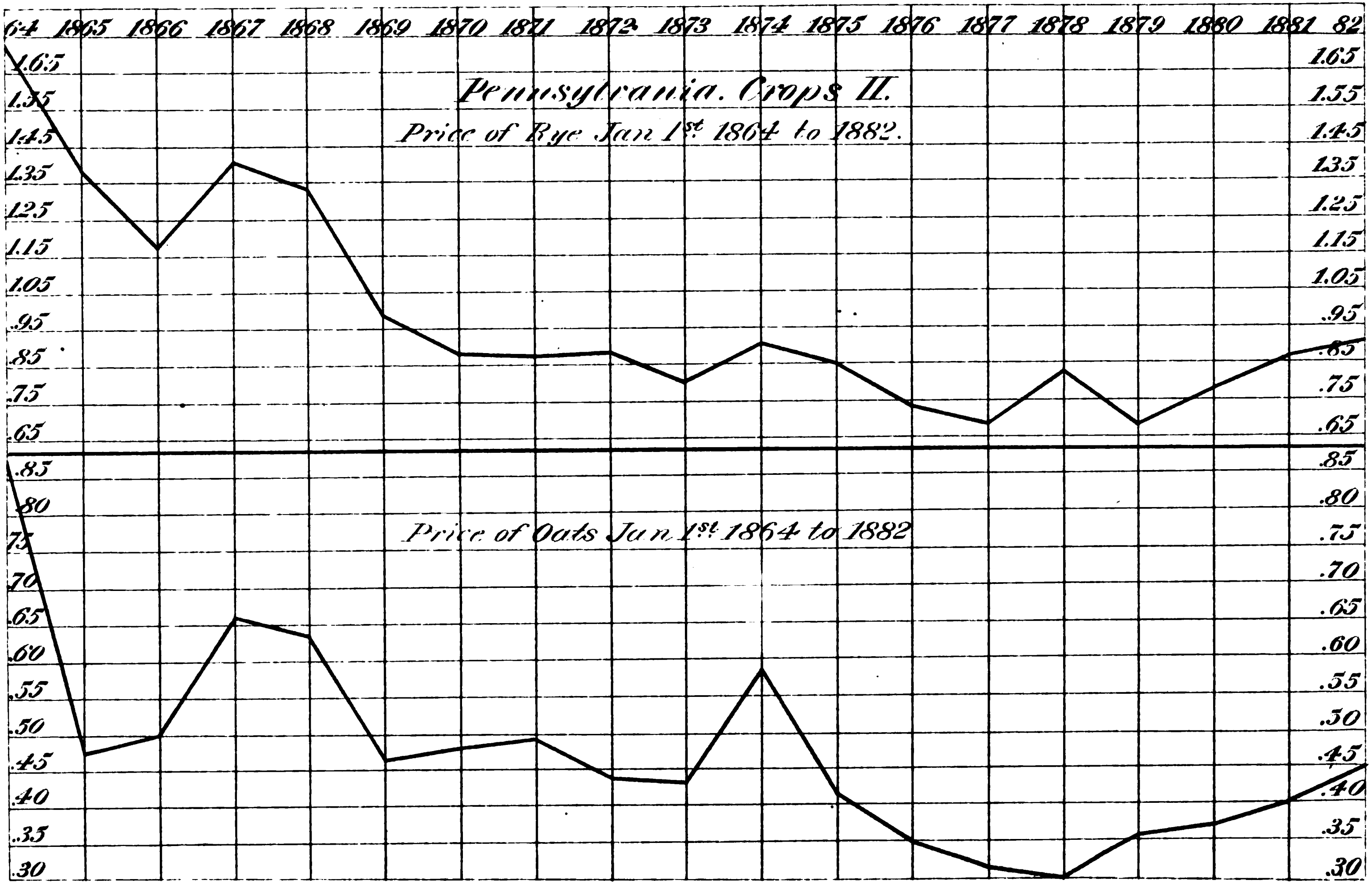
Phosphoric acid, insoluble in coarse medium bone, ...	4½	4½
" " insoluble in coarse bone, bone ash, and bone black, ...	4	4
" " in fine ground rock phosphate, ...	3½	3
Potash in high grade sulphate, ...	7½	7
" in low grade sulphate and kainite, ...	5½	5
" in muriate of potassium chloride, ...	4½	5

Taking this list as a guide, we find the *average* valuation of nitrogen to be 17.7 cents; phosphoric acid, soluble in water, 10.75; phosphoric acid, insoluble, 4.8, and available potash 6.16 cents per pound. Dr. Genth's valuation is 17½, 10, 5, (average,) and 6 cents. As our analysis proves this in the actual article, the lower grade of goods (lowest prices on the above list) prevail, we cannot see why the prices in our list are unfair to the manufacturer, when we adopt the following explanation of Johnson, who, when alluding to those "estimated values," writes: "They are not exact to the cent or its fractions, because the same article sells cheaper at commercial or manufacturing centers than in country towns, cheaper in large lots than in small, cheaper for cash than on time. These values are high enough to do no injustice to the dealer, and accurate enough to serve the object of the consumer."

When our present prices for valuation were fixed, they closely represented the price at which each article could *then* be purchased in the Philadelphia markets. Since then the market value per unit of nitrogen has advanced and receded more than once, and at the present time our valuation is too low to do strict justice to the manufacturer; but on the other hand, if the price fixed for phosphoric acid were to be changed to correspond with the present state of the market, it would have to be lowered somewhat, so that in a complete fertilizer the *total* value would be but little affected, and even if it was materially affected by changes in market value, all articles of the same class would be affected alike, and the value of the comparison would not be lost or injured.

A number of our correspondents seem to have assumed that there is an antagonism of interest between the manufacturers and consumers, and that the manufacturers are, as a class, always trying to cheat the farmer, by putting on the market goods not worth the price asked for them. And we find that the same idea prevails, to a great extent, among farmers generally. There is no reason for supposing that the manufacturers of this class of goods are, as a class, any more likely to prove dishonest than those of any other class, and our analyses clearly proves that our leading firms make their fertilizers of quite as high a grade as the state of the market will permit. In most cases the valuation exceeds the price asked. In a few cases frauds are shown, but not to any greater extent than in any other branch of trade.

There is in reality no antagonism between the interests of the two, but on the other hand there is identity of interest between the honest manufacturer and the consumer. The latter wants a good article, and the former wishes to furnish it, because by so doing his sales (and consequent profits) would be increased. The leading firms in the trade have credit at stake, and they cannot afford to, and will not put goods on the market if their actual value to the farmer falls much below the prices asked. In this case, as we have stated before, the true cause of difficulty is to be found in the fact that, in too many cases at least, farmers demand low grade fertilizers at a low price, and not receiving a benefit equal to that previously obtained from goods of a *higher grade and price*, blame the manufacturer and claim to have been deceived, when they only are in fault; the fertilizer furnished having been worth the money paid for it, but of course not worth as much as an



Pennsylvania. Crops II.

Price of Rye Jan 1st 1864 to 1882.

Price of Oats Jan 1st 1864 to 1882

article costing double the price. We have letters from some of our correspondents showing that they have tried ground limestone, at six dollars per ton, along side of bone costing forty dollars, and who complain of fraud because of the result of the action of the limestone was not as good as that of the bone. Others have complained that aciduated South Carolina rock, at twenty-five dollars per ton, does not give as good an effect as some standard article of fertilizer, costing thirty-eight dollars. The manufacturer must, when he compounds his goods, have reference to the price which he is to receive, and hence for a low price must give a low grade of goods.

In conclusion, we repeat that it is to the interest of both manufacturer and consumer to raise the grade of the goods on the market. If the state of the market compels the manufacturer to charge two and one half dollars for each unit (per cent.) of *available* phosphoric acid in his acidulated South Carolina rock, then the more he can make soluble the better, charging of course a proportionate price for it. The consumer is slowly but surely learning the lesson which his English competitor has already learned, that the higher the price the better, if the *value* is only in proportion, for if he buys his available phosphoric acid, potash, and ammonia by the pound, the less valueless material he has with them, the lower his bill for freight and cartage, and the less the labor of handling. Our farmers are now paying (as is proven by our list of recent analyses,) two dollars per cent. for the available phosphoric acid in their acidulated South Carolina rock—that is to say, they get an article showing say twelve and one half per cent. for twenty-five dollars per ton. Now suppose some manufacturer should put on the market an article *guaranteed* to give forty per cent. acidulated phosphoric acid, and ask for it eighty dollars per ton, how much would he sell? Would not the price *necessarily* demanded at once frighten the average purchaser? And yet the higher price article would be the most economical for the consumer. Our English competitors (both manufacturer and consumer) fully understood this, and hence English fertilizers are higher in grade and price as well as in comparative value.

New Products.

The close competition with the west, into which our farmers have been forced by low-priced land, and a system of low freight rates, has caused a desire for some agricultural product which could be made a specialty. The requirements of such a crop are, that it shall be of such a nature that it cannot be shipped long distances; that the source of supply and demand shall be close together; that the difference between market value and the cost of production shall be sufficient to pay the interest upon high-priced land, and that it will pay for skilled labor and good management.

The three new products which have, during the past year, received the most attention from this department, have been sugar from corn and sorghum, beet sugar, and silk; but neither of these will prevent the close competition alluded to, for each and all of them may, by the assistance of low priced lands and low freight, be shipped an indefinite distance and still compete with our home products. A careful examination into the cost of producing these articles, leads us to believe that they will not furnish our farmers with the relief which they desire, and that at best but a very few will be successful, not because they cannot be produced, but because the cost will exceed the market value.

In order to serve as answers to many inquiries which have been received during the past year, we give the following summary of the information which we have at hand in relation to the products named.

Sugar from Corn or Sorghum.—The production of sugar from the stalks of our common corn is by no means new. So far as our records extend, the first attempt to produce it in quantity was made near Wilmington, Delaware, in 1830; but after producing a considerable amount, the factory ceased operation, because they could not compete with the product of the southern cane—not from the absence of a fair percentage of sugar in the corn, but from their inability to extract it by any process of crystallization then known. Both corn and sorghum stalks yield a fair percentage of cane sugar, but it is in close combination with grape sugar or glucose, which is much more difficult to manage, and which will not crystallize by the same process. It is now claimed that by a newly discovered and patented process, the grape sugar can now be economically converted into sugar. Upon the effect of this and similar processes, the success or failure of the manufacture of sugar from these products depends, for all admit that unless the grape sugar can be utilized, the work must end in a failure.

So far as the actual manufacture of corn or sorghum sugar is concerned, we have found the Jefferson Sugar Company, of Jefferson, Ashtabula county, Ohio, to have been the most successful, and would refer those who may wish information to Henry Talcott, president of the company. This company use the Stewart process, (see annual report Pennsylvania Board of Agriculture for 1879, pages 89-92,) and claim that their success is due in great measure to this fact.

Profs. Weber and Scoville, of the Illinois Industrial University, report the following results of their experiments with cane:

Experiment No. 1.—"The cane selected for this experiment was grown on land which had previously been used. The seed was nearly ripe, and the cane very thrifty.

	Pounds.
Weight of cane crushed,	1.560
Weight of juice obtained,	687-50
Per cent. of juice,	43-40

The juice was carefully neutralized with milk of lime, and brought to the boiling point in the defecating pan. A very heavy green scum rose, and this being removed the juice was seen to be full of a green, light, flocculent percipitate, which did not subsequently rise to the top in any considerable quantity. The juice was now drawn off into tubs, where it was allowed to repose twelve hours. At the end of this time only about one half the juice could be drawn off clear, the percipitate being still suspended in the remainder. It was found impossible to filter this portion, and it was therefore thrown away. The clear juice, after being passed through bone-black, was evaporated in a copper finishing pan to the crystallizing point. The melada had a very unpleasant, saltish taste, owing to the presence of salts of ammonia. The sugar crystallized very readily, and although it looked well it still retained somewhat of this saltish taste after being separated from the molasses. Unquestionably this excessive amount of albuminoids—the green scum and suspended precipitate—was taken up by the plant from the nitrogenous elements of the manure, and the saltish taste was due to ammonium salts, which came from the same source.

Manure, therefore, not only has a deleterious effect upon the development of sugar in cane, but it also prevents the thorough defecation of the juice which is necessary to the manufacture of sugar."

Experiment No. 2.—Size of field, 3-16 of an acre.

	Pounds.
Stripped cane, with tops,	18,535.3
Stripped cane, without tops,	15,765.9
Weight of juice obtained,	6,545.6
Per cent. of juice of stripped and topped cane,	41.52

	Pounds.
Weight of melada from juice,	1,298.7
Weight of melada from bagasse,	253.9
Total weight of melada,	1,552.6
Weight of sugar from juice,	504.0
Weight of sugar from bagasse,	104.7
Total weight of sugar,	608.7
Weight of molasses from juice,	794.7
Weight of molasses from bagasse,	149.2
Total weight of molasses,	943.9

Calculations for one ton topped and stripped cane:

Weight of juice,	830.4	Weight of molasses,	119.7
Weight of sugar,	77.2		

To obtain the sugar from the bagasse it was packed in large barrels as it left the mill, and was exhausted with water. The percolate thus obtained was treated like juice.

Experiment No. 3.—	*Pounds.*	*Experiment No. 3.—*	*Pounds.*
Weight of stripped and topped cane,	1,440	Per cent. of juice,	44.2
Weight of juice,	637	Weight of melada obtained,	145.8

Experiment No. 4.—	*Pounds.*	*Experiment No. 4.—*	*Pounds.*
Weight of stripped and topped cane,	1,661.0	Weight of melada from bagasse,	13.5
Weight of juice obtained,	603.5	Sugar from juice,	41.5
Per cent. of juice,	36.33	Sugar from bagasse,	6.0
Weight of melada from juice,	95.5	Molasses from juice,	54.0
		Molasses from bagasse,	7.5

From a lengthy report furnished us by Henry Talcott, President of the Jefferson Sugar Manufacturing Company, we make the following extracts:

"The culture and variety of cane is a matter of great importance. We must raise a variety that will mature before frost reaches us in this climate, and it is generally supposed the early amber is the surest for us. I don't feel like giving rules for the cultivation of it, because other men here did produce larger and better cane than I could last season. It was almost impossible for me to get my seed to sprout at all, and did not succeed in getting half a fair stand of it on the ground. Even after the third planting, it was so cold and wet all the fore part of the season, my land would not give it a start. When it did come to the surface the grass got the start of me, and it was a very hard job to get it hoed fairly the first time, but when that was done it was comparatively easy to do the rest, for I planted in hills three and one half feet apart, and aimed to have six stalks in a hill, and then could do most all the work with a common cultivator, the same as in my corn field. I had exactly the same trouble last season with my corn that I did with my cane, only it was a worse failure, and all in the same field. No matter what plan of cultivation you may pursue, only so you produce good-sized, well-matured stalks, they will then be full of sugar. But when the harvest comes, then the management must be perfect. To secure the best results, first find out what day the mill can work your cane, then have help enough to strip off the leaves and tops with the seed. About one foot of the seed top is of no account for sugar, also at the same time cut the stalks and keep a team busy carrying them to the mill. Five men will cut eight or ten loads per day, or about one acre, so you can calculate from the distance you have to haul it how much help you need. Again, if hands are scarce, you must change work with your neighbors, and in this way each one can have it properly done. Five hands in our field last year kept the team busy, and eight cut six loads per day, which filled a common two-horse wagon box, and weighed about 2,500 pounds each, and when boiled down made about eight or ten gallons of thick mush sugar from each load. Of course the little distance we have to haul ours would make it very profitable business for us, when others might lose money who could deliver but one load per day."

Beet Sugar.—In our previous reports we have alluded to this product, and can now do but little further than repeat. The existence of a large percentage of sugar in beets is admitted, but as with corn and sorghum, the problem is to extract in a marketable form at a maketable cost. Thus far all attempts to obtain *profitable* sugar from this crop have failed to to give a return which would warrant the continued manufacture. One cause of this is no doubt to be found in the difficulty of obtaining a market for the crushed beets after the sugar has been extracted, and unless this can be utilized, success need scarcely be expected.

As indicative of the percentage of sugar which may be expected, we give the following result of the examinations made by our board of thirty-nine samples raised under various circumstances, and with a variety of fertilizers on different soils:

Number.	KIND OF SEED.	Per cent. of total solids in juice.	Per cent. of sugar in juice.	Per cent. of impurities in juice.	Per cent. of sugar in total solids in juice.
1	Vilmorin,	15	11.4	3.6	76
2	Quidlinberger,	11	7.6	3.4	60
4	White Silesian,	10.5	6.9	3.6	65
5	White Silesian,	10.5	6	4.5	65
6	White Silesian,	10.5	6	4.4	57
7	White Silesian,	10	6.4	3.6	64
8	Imperial,	11	8	3	72
9	Imperial,	11	7.7	3	70
10	Vilmorin,	13	9.6	3.4	74
11	Quidlinberger Nursery,	10.5	7.7	2.8	73
12	Carter's Prize,	12.5	9.4	3.1	75
13	Breslau,	10	8.4	1.6	84
14	Carter's Prize,	10.5	6	4 6	57
15	Quidlinberger,	10	6.5	3.5	65
16	Imperial,	10	6.4	3.6	64
17	Vilmorin,	10	4.9	3.1	69
18	Breslau,	9	6.3	2.7	70
19	White Silesian,	10	5.5	4.5	55
20	Long Blood,	9	6.4	3.1	67
21	White Silesian,	9	5.2	3.8	58
22	White Silesian,	9.5	5	4.5	52
23	White Silesian,	10.5	5.5	5	52
24	White Silesian,	9	5.4	3.6	60
25	White Silesian,	8.5	4.7	3.8	55
26	White Silesian,	10	6.4		
27	White Silesian,	11	6.7	4.3	60
28	White Silesian,	11	7.4	3.6	67
29	White Silesian,	10.5	7.8	2.7	74
30	White Silesian,	11	7.4	3.6	67
31	White Silesian,	10.5	6.9	3.6	65
32	White Silesian,	8	5.4	2.6	67
33	White Silesian,	11	6.9	4.1	63
34	Imperial,	7.5	4.1	3.4	54
35	White Silesian,	11	5.7	5.3	52
36	White Silesian,	10	6.4	3.6	64
37	Carter's Prize,	12	7.4	4.6	62
38	White Silesian,	9.5	5.2	4.3	55
39	White Silesian,	9.5	5.2	4.3	55

The following, from the report of the Santa Cruz Beet Sugar Manufacturing Company of California, will furnish the best data as to cost of fixtures, product, &c., at our command:

According to official report, this factory has a capacity of nine thousand tons of beets during the working season of one hundred and eighty days, or fifty tons per day. The land belonging to the company has produced six thousand five hundred tons of beets, and they buy, at the rate of five dollars per ton, all that are offered. Their actual working season is about one hundred and fifty days. The cost of the works and fixtures is about $100,000, and the daily expense of running them was stated as follows:

50 tons beets, @ $5,	$250 00
16 cords wood, @ $3,	48 00
65 men's wages,	90 00
Lime,	5 00
30 sugar barels, @ 70 cents,	21 00
Chemicals,	4 00
Freight on 4 tons sugar,	8 00
Lights,	4 00
Repairs,	10 00
Commision on sales,	24 00
Insurance for one day,	8 00

Making a total cost of one day's run, $472. The product for one day is given at 8,000 pounds of sugar, worth, in market, 11½ cents per pound, or $920, leaving $448 for interest upon capital, taxes, and profit.

In addition to the above product of sugar, they report:

2,700 tons refuse pulp, @ $2,	$5,400 00
300 tons syrup, @ $10,	3,000 00

and 500 tons refuse lime, valuable for land.

Silk Culture.—Of the character and amount of information which your special committee on silk culture may have to present, your Secretary has no means of knowing, and would state that in most cases all correspondence relating to this product has been turned over to the committee. The general correspondence of the office has, when summarized, presented the following items:

The indications are that if this crop is to be profitably produced in Pennsylvania, it must be in small amounts by any one producer. Experience not only in Europe, but also in this country, prove that the highest degree of success has been attained where each family (as is the case now with poultry) keeps a limited number of worms, and dispose of the product to dealers. In all cases where attempts have been made to keep the worms in large numbers, a failure has been recorded, and it is now accepted as an axiom that silk worms will not bear crowding in large cocooneries.

Mr. Crozier of Silkville, Kansas, furnishes the following items of cost and profit of this product:

"The silk throwsters from France, seeing our silk and cocoons at Philadelphia, offered twelve dollars for the reeled silk, when we refused to sell the cocoons. Not quite ten pounds of green cocoons made one pound of reeled silk; out of three thousand pounds of cocoons we got three hundred and thirty pounds of reeled silk, as beautiful and stout as the best French silks, and though a Yankee girl, having hardly three months' practice, did reel it, we got the highest price in French markets that year, say twelve dollars per pound, or $3,960 out of our whole crop. Out of the litters and wastes we paid one third the expenses. These were:

First molt,	$4 50
From the first to the second molt,	4 80
From second to third molt,	9 60
From third to fourth molt,	21 60

From fourth molt to spinning cocoons,	$38 40
Picking cocoons at one cent per pound,	30 00
Picking leaves at 30 cents per 100 pounds—30,000 pounds,	90 00
Rent of two stables, fifteen days, for use of cocoonery,	30 00
Rent of capital used for shelves, trees and land—$400 at ten per cent.,	40 00
Overseer, and other little expenses,	100 00
Total expenses,	$368 90
Net profit on cocoons only,	2,032 00
Money left in the country for seven acres,	$2,400 90

"This result is brought into the country by raising the cocoons only, the reeling mills extracting the *grege* or raw silk from them, will leave to the miller or his operatives, $3,950 out of seven acres of upland, second quality. The other silk industries will increase this result to about one half or two thirds more; this is the result for the whole country."

Investigation of Diseases among Live Stock.

Since the passage of the act for the suppression of contagious lung fever or pleuro-pneumonia, our annual appropriation bill has contained an item of two hundred and fifty dollars for the investigation of diseases of live stock, and the expense of each year since the provision was made, clearly prove that a large amount of good can in this way be accomplished with a very moderate expenditure of money.

All cases of disease among live stock, as soon as reported to the Secretary, and if after examination the features of the case are found to be such as would warrant an examination, an experienced veterinary surgeon has been sent to make investigation and to give advice and relief without cost to the individual. The large number of cases and the limited amount appropriated of course preclude even a casual examination of all the cases reported. In very many cases the symptoms given were such as would enable the Secretary or veterinary surgeon to give proper advice without the expense of a visit to the diseased stock, and even in this unsatisfactory way much good has been accomplished and many animals saved.

In most cases the diseases reported have been such as are exhibited every year among the live stock of the State; the exceptions to this rule during the past year have been husk or hoose, (Phthisis pulmonalis verminalis,) Splenic apoplexy, (authrax fever,) and "Red water" or "Wood evil."

Husk or Hoose.—In our examination into supposed cases of contagious lung fever, (pleuro-pneumonia,) it is found that husk or hoose, usually among young stock, has in most cases been mistaken for the more formidable disease. For a full description of this disease, with means of prevention and cure, the reader is referred to the report of C. B. Michiner, D. V. S., veterinary surgeon of the Board in our annual report for 1880, pages 92–94. This disease being caused by a parasite, is of course in the common acceptance of the term contagious, because these parasites, when deposited in the food or body of the animal, are taken up and propagated in the lungs and air passages of other animals. Of these parasites, one of our best authorities writes as follows: "The *strongyli* in their mature condition inhabit the air passages within the lungs, but they may be reproduced either in or out of the body. In the first mode the female worm creeps into an air cell and there encysts herself and produces eggs or young worms already hatched, or she dies, and the myriad of eggs hatching out amid the débris; the young worms finally immigrate into adjacent air passages, grow to maturity, and reproduce their kind. In the second method the impregnated female worm is expelled by coughing, and perishes in the water or in moist earth or in vegetables, and the eggs escaping from her decomposed remains, may lie unhatched for months or even a year, or, in genial weather, may rapidly open and allow the escape of almost microscopic embryo worms. These in turn may live an indefinite time on the water or moist soil or on vegetables, and only begin to grow to their mature condition when taken in by a suitable host with food or water."

The symptoms of this trouble are very similar to those of bronchitis or ordinary cold, commencing with a slight husky cough, which gradually increases in frequency and intensity. In many cases, the animal affected is hide-bound, and is affected with dropsical swelling on the jaws or head, and, in extreme cases, in other parts of the body. When allowed to run its course, without treatment or hindrance, it will usually affect all of the younger members of the herd, and, if accompanied with poor food, exposure, and bad treatment generally, will affect, and in some cases prove fatal to, full-grown animals. If unchecked, death may take place in two weeks, or life may be prolonged for two months or ten weeks. As the trouble is due to a parasite, all remedies and treatment must (to be of any use) be directed to the removal and death of the *strongyli.* In *bad cases*, the death and complete burial of the animal is usually the most economical course, for, if badly infected, the animal, even if it does overcome the attacks of the parasite, will be stunted, and will fail to yield a profit to the owner, and, during the whole time it is under treatment, may be scattering over its stable, provender, and surrounding objects the embryo of still further trouble to other stock. The first step is, of course, the complete isolation of all infected stock; the destruction or removal of all provender, straw, &c., to which the infected stock has had access; a thorough whitewashing of all wood-work within the reach of the animals, and the removal of all manure. As a prevention, remove even the apparently well stock to dry upland pasture, and supply them with nutritious food in liberal amounts. Liberal allowances of common salt will also assist in the cure. All infected animals should be placed in a light building or stable, in which sulphur should be burned in a hot-pot or shovel until, by inhaling the fumes, the animals removes the parasites from the lungs by coughing. To assist in the cure, each animal should have (according to size and age) from one to two tablespoonfuls of spirits of turpentine, administered with a small amount of milk or linseed oil. The thorough fumigation with sulphur and the doses of turpentine may be kept up once each day for five to ten days. In this, and all diseases of a similar nature, which involve a weakening of the system, a brine, consisting of equal parts of gentian, ginger, and sulphate of iron, may be given at the rate of from one fourth to one half ounce, according to the size of the animal.

Red Water or Wood Evil.—The color of the urine voided by animals affected with this disease has led most observers to class the difficulty among diseases of the bladder, and hence, the name "bloody urine," which, however, as the urine does not contain blood clots, is a misnomer. This disease is essentially one of the liver, and, in nearly all cases, may be traced to the use of unwholesome or innutritious food. In two of the cases which the Secretary was called upon to investigate, the animals had been poorly kept during the winter and in the early spring, while in low condition, been turned out in the woods while the small amount of grass obtainable was weak and innutritious, and where the animal was compelled to browse on the immature leaves of bushes and shrubs. By this course of treatment the blood became deficient in albumen, and death followed for shere starvation or insufficiency of nutriment in the food. In such cases the first step is to remove the cause; give the animals plenty of good clean hay, or if in proper season, good *upland* pasture; give them extra food in the form of ground oats, barley, or other grain; give a tonic as recommended in cases of Husk or Hoose, with the addition of two or three raw eggs twice each day. Of this disease Prof. Law writes: "This is essentially a disease of unimproved localities, and attacks animals fed too exclusively upon the products of such land, which was naturally stimulating to the digestive organs and liver. Turnips and other sacharine roots, though perfectly safe from ordinary soils, are dangerous from these, and in the natural meadows and woods the young shoots of resinous trees, (coniferœ,) and the acid plants of ranunculus, colchicum, and asclepias families are held responsible for it. Its prevalence in woods and uncultivated meadows has produced for it in almost all European countries some name equivalent to "wood disease." An important element in the causation is the existence of soil, rich or organic matter, and soured by the stagnation of water owing to a clay or otherwise impervious sub-soil. Cows are very susceptible just after calving, and often perish. *Prevention* may be sought in thorough drainage; in restricting the allowance of objectionable food, and supplementing it with sound grain and fodder; in avoiding damp, woody, and natural meadows in the spring until there is a good growth of grass, and in rejecting hay from faulty pastures containing an excess of acrid plants."

Spleenic Apoplexy.—An outbreak of this disease near Womelsdorf, Berks county, caused much alarm in the neighborhood, and owing to the absence and illness of the Secretary, this alarm was not checked until it had been magnified by newspaper paragraphs into a formidable and unknown disease, which was (in other portions of the State) supposed to be destroying whole herds of cattle. The primary steps in the investigation clearly showed the the nature of the disease, and that instead of being contagious pleuro-pneumonia, rinderpest, or some new epidemic, it was a comparatively well-known disease, and solely due to local causes. The following from the pen of Prof. Law so completely covers the case that we transcribe it entire:

"It is propagated by *contagion*, but tends to die out when produced in this way only. It is transmitted by contact with the blood liquid exudations, portions of the diseased carcass, fat, skins, hair, wool, bristles, feathers, and bowel evacuations, and rarely, or not at all, through the atmosphere. Simple contact of these matters with the healthy skins of a susceptable subject is enough to produce the disease. The virus is most potent when received from an animal still living or recently dead, and yet may be preserved for months in all conditions of climate, temperature, and humidity.

Its *development* in a locality is determined: 1. By the rich surface soil abounding in organic matter and the impervious sub-soil preventing natural drainage. 2. The frequent inundations of banks of rivers flowing through level countries, *and the drying up of ponds and lakes, leaving much organic deposit in their basins.* 3. *A continuation of warm, dry weather which favors organic emanations from such places as the above.* 4. A condition of the system of the animal predisposed to the reception and growth of the poison, and consisting in the loading of the blood with plastic or waste organic matter, as in the overfed plethoric animals, in those making flesh most rapidly, or the young and rapidly growing, or those rendered unhealthy by overwork, impure air, *unsuitable food, or water.* 5. Sudden chills when the poison is already present; hence extreme variations in the temperature of night and day. 6. *A close, still atmosphere.*

The same authority gives the following as the symptoms of spleenic apoplexy: "The patient ceases feeding and ruminating, or does so irregularly, trembles, has partial sweats, staring coat, varying heat of body, arched back, quarters rested on the stall or fence, or lies with the head turned to the flank. A high temperature (105° to 107°) precedes the outward symptoms by hours or days. The eye is shrunken, dull, watery, with shades of brown and yellow and dark spots. Remarked in the horse: Breathing hurried, heart's action violent, pulse, weak, loins and back tender, or even crepitating, urine bloody, bloody liquids escape from the nose, anus, or eyes, and the dung is streaked with blood. As the disease advances the temperature of the body decreases, and the patient dies in convulsions or quietude or makes a rapid recovery. The fatal results usually take place in from twelve to twenty-four hours."

As in the case of all other contagious diseases, the first care should be to remove, as much as possible, all sources or vehicles of contagion. None but those taking care of the stock should come into the inclosure, and no contact with other animals should be permitted. All stables should be airy and as open as the season or circumstances will permit. Protection from the extreme heat of the sun is essential. All carcasses, dung, straw, or hay should be burned or buried. Innoculated pastures should be avoided for the balance of the season, or at least until after several heavy rains, and as much as possible keep the stock from damp pastures, likely to breed malarious diseases.

It is to be regretted that, in cases of outbreaks of the kind which occurred at Womelsdorf, your officers can only exercise an advisory power; in this case the duration of the outbreak was much prolonged, and the loss of stock increased by a failure to adopt such precautions and administer such remedies as were suggested by competent veterinary advisers. It is also much to be regretted that this outbreak received such newspaper notoriety, and was exaggerated to such an extent. The effect of such notoriety and exaggeration is not local in its effects, but more or less affects the cattle trade of the whole State, and even of the United States. Since the outbreak, your Secretary has received communications from foreign consuls anxious to report the truth to their home Governments, and, as a result, numerous very much exaggerated reports have been "officially" transmitted to Europe, much to the injury of our foreign trade in dressed beef. The disease is not a new one; it may be controlled by proper measures, and by proper precautions may be prevented, or if not entirely prevented, may be kept within the herd in which it breaks out. By proper quarantine regulations and an early report to proper authorities, there seems to be no good reason why the disease should spread to neighboring herds. It may not exhibit itself in the same locality for many years, or may never be noticed there again; on the other hand, with a continuation of similar local causes and circumstances, it may break out again in even a more virulent form next season. Prevention, in this case as in others, is less expensive than cure, and the causes proved by this outbreak to have once existed, should be removed as much as possible, or in lieu of a removal of the cause, the stock should be kept away from the pasture in which they were infected. Such outbreaks are most common during the close of the summer or early in the fall, and the one noticed as somewhat peculiar as having occurred early in the season.

Tuberculosis.—In June last the attention of your Secretary was called to the prevalence of an unknown disease in the Cumberland valley, which had baffled all attempts at cure, and which was at first supposed to be contagious lung fever or pleuro-pneumonia, and was reported to the State authorities as such. A careful investigation of the case by the State surgeon proved it then to be tuberculosis in a contagious form. The disease is reported to have been first introduced by a thorough-bred Jersey bull, and by him to have been transmitted to his calves by hereditary taint, and by them propagated and spread in the herds into which they were taken. The existence of similar cases had long been admitted by our best veterinary surgeons, but this being the first case reported to the State authorities, was made the subject of special inquiry and investigation. In the herd, which we were called upon to examine, the local surroundings were against the propagation of the disease; the animals had good pasture, plenty of pure water, shade in the fields, and quite as good care as is usually accorded to such herds, and the owner, having a much more than average knowledge of veterinary practice, had done all he could to prevent or mitigate the disease. An animal in the last stages of the disease was killed, and the post mortem fully demonstrated the correctness of the surgeon's diagnosis of the case. One of our best authorities in veterinary science, in alluding to the treatment of this disease, writes: "This (the treatment) is unsatisfactory as being rarely successful, and even then in preserving an animal which is dangerous as a breeder for producing a progeny predisposed to this disease, and for slaughter and dairy purposes, as possibly conveying the malady to man. The most promising course is to secure dry, pure air, sunshine, a genial temperature, rich and easily digestible food, containing abundance of fat, (linseed, corn, beans, peas, potatoes,) a course of tonics, (linseed or cod liver oil in small doses, sulphate of iron, quinine, gentiaia, etc.,) and antiseptics, (fumes of burning sulphur, bisulphite of soda, sulpho-carbnoate of iron, &c.) Prevention would include drainage, shelter of pastures by trees, avoidance of changes to cold or damp localities, a warm sunny location for farm buildings, suitable feeding and watering, the prevention and cure of all debilitating, and especially chronic diseases; protection against overwork or excessive secretion of milk in a stimulating and insufficient diet, securing young and undeveloped animals against breeding, and milking at the same time, rejection of tuberculosis subjects from breeding; the prompt removal of all such animals from pastures or buildings used for the healthy, and the thorough disinfection of all places where they have been kept."

It should not be assumed that this disease is alone due to hereditary taint. It may also originate in a case of pneumonia or severe cold; but having originated from any local or specific cause, is nearly always transmitted by hereditary taint, or by infection by diseased matter expelled from the diseased organ and taken into the circulation of the healthy animal. Once fastened in the system, it may undoubtedly be propagated from the secretions of the body, and may be transmitted to the human subject, through the medium of the milk of diseased animals or by their flesh, if not thoroughly cooked.

Hog Cholera.—We have also been called upon to investigate a number of cases of hog cholera; but the outbreaks have thus far (November 1) been less in number than during former years. It is to be regretted that no reliable remedy or treatment is known for this disease, and, hence, all that we can do is to advise such care and treatment as will prevent its further spread. Those of our readers who are interested in the symptoms and treatment of this disease, are referred to the report of C. B. Michener, Veterinary Surgeon of the Board, as given in our annual report of 1877, page 153, in which the symptoms are thus described: "The first few pigs will die, often, before any notice is taken of their being sick. On careful observation, we note that the temperature of the body varies; animals stagger; bury themselves in the straw; urine and fœtus scanty; lie on the abdomen; suffer colicky pains, and may be delirious or comatose. Paraplegia and diarrhœa often set in the latter stages of disease. The skin presents numerous red or purple spots, particularly on the abdomen, inside the thighs, back, and ears. At first, by pressure, these spots disappear.

The pulse, though small and weak, is rapid. As the disease advances, the diarrhœa becomes profuse, very offensive, and of a dark color. At times, the diarrhœa is entirely absent, and the fœces are continually voided in hard lumps, coated with patches of mucous membrane. Breathing impeded, owing to congestion of the lungs. The treatment resolves itself into preventive and curative. To prevent the disease, avoid all sources of contagion. If in a pen, have it dry and built on high land. Change the diet, and insist on strict cleanliness. Antiphlogistic measures are to be resorted to at the outset. Give an emetic, followed by saline purgatives, mixed with ginger and ale. Give plenty of exercise on the ground."

In conclusion, we would ask that our farmers and stock breeders, when they appeal to the Board for assistance in arresting the outbreak of any not properly understood disease, should plainly state all symptoms and surrounding circumstances; the fund available (two hundred and fifty dollars) is very small in proportion to the amount of work to be done. A more careful attention to proper reporting of symptoms would not only save the department much trouble and its officers unnecessary journeys, but would enable us to accomplish more good with the limited means at our command. As instances of how a failure to state symptoms may operate, your Secretary was called upon by telegraph to visit an outbreak of a disease, (supposed to be contagious lung fever,) and on arriving in the "infected" locality, found the whole trouble was due to the fact that three of the animals, during the preceding day, had access to the meal-box in the entry of the barn. The owner did not know this, but his sons did. A clear expression of symptoms would have saved the time and expense of the journey, and enabled the Board to have devoted an equivalent amount to cases more worthy of examination. In another case one of our surgeons was telegraphed for in great haste to check an outbreak of supposed contagious disease in Montgomery county, which, on further examination, proved to be simple hoven, caused by the stock having broken into an adjoining corn field, the fact having been concealed from the owner by employés fearful of blame.

In all cases the statement of symptoms should be full and complete in order that the proper parties may be able to arrive at an appreciation of the importance of the case, and it should not be supposed that this fund is sufficient to afford veterinary advice in all cases in which help is applied for. The work done under this appropriation must be distributed over the whole year, and cannot be confined to only one locality or district, to the exclusion of others.

Cost of Crops.

So much has been said and written with regard to the result of the competition between the east and west in the *profitable* production of grain and farm stock, the Secretary of the Board has at different times issued special blanks to his official reporters, asking for estimates of the actual cost of these items. In a number of cases these blanks were also sent to farmers who were known to keep a regular debit and credit account with their farms. The result of this examination has been, that a number of our correspondents have stated that the collection of data necessary for the proper answers, has afforded them much instruction, and quite a number who have never before given the matter special attention, freely admit that the margin between the cost of the *average* bushel of Pennsylvania grain and its selling price is very small, and that many farmers in the State produce crops which are an actual loss to them in outpaid cash. The remedy for this is to be found in improved modes of farming, greater attention to the making and *saving* of manure, and the more skillful employment of capital and labor. Some seek to account for the fact upon plea of an unjust freight discrimination in favor of the western grain growers; but while this may have its effect, yet we think other items of mistaken economy conspire to assist in producing the result. We think our tables of the past four years, based as they are upon practical results, fully prove that much of our grain is produced at a loss, or in other words, costs more than it is worth in market.

From these tables we find the *average* estimated cost per bushel of the different kinds of grain during the different years, to have been as follows:

	Corn.	*Wheat.*	*Oats.*	*Rye.*	*Potatoes.*
1877,	44 cents.	82 cents.	25 cents.	63 cents.	25 cents.
1878,	48 cents.	97 cents.	26 cents.	67 cents.	27 cents.
1879,	47 cents.	91 cents.	29 cents.	57 cents.	22 cents.
1880,	37 cents.	85 cents.	26 cents.	60 cents.	27 cents.
Average,	44 cents.	89 cents.	26½ cents.	61 cents.	25 cents.

The table as above given reports the *average* estimated cost. Many of our reporters have furnished us with the figures upon which they have based their estimates, and in order that our readers may judge of the correctness of the general result we give them here, only specifying the county from which they came.

The results as given are not all for any one year, but they must be gauged by the crops of the past season. In all cases where the yield in bushels is given, the reader may obtain the data for his own crop by applying to the calculations of our correspondents the number of bushels per acre produced during *any season*, upon his own farm.

LANCASTER—WHEAT.

Interest on cost of land,	$4 50
Taxes,	75
Wear and tear of implements,	50
Five hundred pounds of bone, (one half charged,)	4 37
Plowing, harrowing, and drilling,	2 50
Twenty-two loads barn-yard manure, (one half charged,)	16 50
Hauling, one day,	2 50
Spreading, one day,	75
Threshing and cleaning,	2 88
Total,	$35 25

Yield, thirty-six bushels. Cost, 98 cents per bushel.

LEBANON—WHEAT.

Interest and taxes,	$9 00
Manuring,	4 00
Plowing,	1 50
Harrowing and sowing,	1 50
Seed,	2 50
Harvesting and threshing,	2 50
Total,	$21 00

Crop, twenty bushels per acre. Cost, $1 05 per bushel.

LEHIGH—WHEAT.

First plowing,	$2 50
Manure,	4 00
Harrowing,	62
Second plowing,	1 75
Harrowing,	62
Drilling,	1 25
Seed,	2 70
Wear and tear of implements,	50
Interest,	4 80
Cutting, &c.,	2 00
Taxes,	75
Hauling, threshing, &c.,	3 10
Total,	$24 60

At the actual yield given by this reporter, (twelve bushels per acre,) the cost per bushel was $2 05. Had the yield been twenty bushels per acre, the cost per bushel would have been $1 23. With a yield of thirty bushels, (which would have been a fair crop,) the cost per bushel would have been 82 cents.

BUCKS—WHEAT.

Sixteen acres in field.

One hundred and sixty loads of manure, (one half charged,)		$160 00
Hauling and spreading manure,	16 days,	40 00
Plowing, (first time,)	10 "	25 00
Harrowing,	4 "	10 00
Plowing, (second time,)	10 "	25 00
Harrowing,	2 "	5 00
Drilling,	2 "	5 00
Drilling, (extra man,)	2 "	2 00
Seed, (24 bushels,)		30 00
Reaping,	2 days,	5 00
Binding,	8 "	12 00
Hauling in,	2 "	5 00
Extra men, (hauling in,)	2 "	2 50
Threshing,	3 "	7 50
Extra help,	3 "	3 00
Cleaning,	6 "	6 00
Interest,		96 00
Taxes,		16 00
Total,		$455 50

Crop, twelve and a half bushels per acre. Cost per bushel, $1.52.

LEBANON—CORN.

Interest and taxes,	$9 00
Plowing,	1 50
Harrowing and seed,	2 50
Lime,	5 00
Harvesting, &c.,	3 00
Total,	$21 00

Crop, forty-five bushels per acre. Cost per bushel, 46 cents.

LANCASTER—CORN.

Interest and taxes,	$5 25
Wear and tear of implements,	50
600 pounds bone, (one half charged,)	5 25
Plowing and harrowing,	2 50
Cutting, husking, and shelling,	4 86
Total,	$18 36

Yield sixty bushels per acre. Cost thirty and one half cents per bushel.

LEHIGH—CORN.

Plowing, harrowing, and marking out,	$3 62
Putting on ashes,	3 00
Planting and seed,	1 75
Cultivating,	2 49
Cutting and harvesting,	3 00
Shelling, &c.,	1 50
Interest, taxes, &c.,	6 05
Total,	$21 67

Crop, forty bushels per acre. Cost, fifty-four cents per bushel.

BUCKS—CORN.

The following is from actual results on a field of sixteen acres:

160 loads of manure,	$160 00
12 days plowing,	30 00
4 days harrowing,	10 00

1 day marking out,	$2 50
3 days planting,	2 00
3 days harrowing,	7 50
3 days replanting, &c.,	3 00
Seed corn,	1 20
Cultivating and hoeing,	16 50
12 days cutting,	12 00
Husking, at three cents, (1,040 shocks,)	31 20
Hauling, &c.,	20 00
Interest and taxes,	112 00
Total,	$419 40

Crop, eight hundred bushels. Cost per bushel, fifty-two cents.

LUZERNE—CORN.

Preparing ground,	$3 00
Manure,	7 50
Lime,	1 87
Planting and seed,	1 08
Working,	2 00
Cutting,	1 00
Husking, &c.,	3 25
Interest and taxes,	4 00
Wear and tear of implements, &c.,	1 00
	$24 70
Fodder,	8 00
Total,	$16 70

Yield, forty bushels per acre. Cost, forty-one and three quarter cents per bushel.

LEHIGH—OATS.

Plowing,	$2 50
Harrowing,	62
Sowing,	25
Seed,	90
Cutting and binding,	1 50
Hauling in,	1 25
Threshing, &c.,	2 00
Interest, taxes, and wear and tear,	6 05
Total,	$15 07

Yield, forty bushels per acre. Cost, thirty-seven and one half cents per bushel.

LANCASTER—OATS.

Interest on land for six months,	$2 25
Taxes,	37
Wear and tear of implements,	25
200 pounds bone, (one half charged,)	1 75
Plowing and harrowing,	2 50
Threshing and cleaning,	1 50
Total,	$8 62

Yield, thirty-five bushels per acre. Cost, twenty-five cents per bushel.

BEAVER—OATS.

Plowing,	$2 50
Harrowing,	25
Drilling,	40
Seed,	66
Cutting,	1 00
Hauling in,	60
Threshing,	1 66
Interest,	1 50
Manure,	1 50
Total,	$9 07

Yield, thirty-three bushels per acre. Cost, twenty-seven and one half cents per bushel.

LANCASTER—POTATOES.

Interest on land,	$4 50
Taxes,	75
Wear and tear of implements,	50
Two tons bone, (one half charged,)	40 00
Plowing and harrowing,	2 50
Working,	3 00
Digging, &c.,	15 00
Total,	$66 25

Yield per acre, four hundred bushels. Cost, sixteen and one half cents per bushel.

LEHIGH—POTATOES.

Plowing, $2 52; harrowing, 62 cents,	$3 12
Marking out and planting,	1 62
Seed, $4 80; manure, $4 00,	8 80
Cultivating, $1 25; plowing, $1 00,	2 25
Plowing out, $1 50; picking, $2 00,	3 50
Hauling in, interest, and taxes,	6 05
Total,	$27 34

Yield, one hundred bushels. Cost, twenty-seven and one half cents per bushel.

LUZERNE—HAY.

Manure and lime,	$9 37
Interest and taxes,	4 00
Cutting, making, and hauling,	3 50
Wear and tear, &c.,	2 00
Total,	$18 87

Yield, per acre, two tons. Cost, nine dollars and eighty-three cents per ton.

LEHIGH—HAY.

Mowing, curing, raking, &c.,	$2 75
Hauling in,	2 00
Interest, taxes, &c.,	5 75
Total,	$10 50

Yield, per acre, one and one half tons. Cost, seven dollars per ton.

Cost of Live Stock.

For the purpose of obtaining data similar to that previously asked for with reference to the *cost* of farm crops, blanks were (during two years) sent out to our reporters, and when returned, properly filled out, were tabulated, go to show the estimated cost of each kind of live stock in each county in the State. While these reports show considerable variation in the views of different correspondents, yet when tabulated as collected, at the rate of five or six to each county, we think the average would prove a fair one, and not far from correct.

To illustrate the manner in which these reports were made, we give three in full, as they reached this office:

Lebanon—Cow at One, Two, and Three Years Old.

First Year.—Calf, two weeks old,	$2 00
Chop feed and milk,	8 00
Hay and grass,	6 00
Care,	2 00
Cost one year old,	$18 00
Second Year.—Pasture,	6 00
Chop and feed,	5 00
Hay,	6 00
Care,	2 00
Cost at two years old,	$36 00
Third Year.—Pasture,	9 00
Hay,	7 00
Chop and feed,	14 00
Cost at three years old,	$66 00

This is an extreme estimate, and exception may be taken to it, because during the last six months of her third year the cow should have given enough milk to have partly paid for her keep during that year, and should have had credit for a calf. On the other hand, one correspondent claims that his figures and results are based upon his actual experience.

Another one of our reporters, who is a member of the Board, gives the following figures, as based upon his own experience:

First Year.—Milk, meal, &c.,	$5 52
Pasture,	2 50
Hay, fodder, &c.,	5 20
Cost at one year old,	$13 22
Second Year.—Corn, bran, &c.,	4 14
Pasture,	3 00
Hay,	5 00
Fodder, salt, &c.,	2 40
Cost at two years old,	$27 76

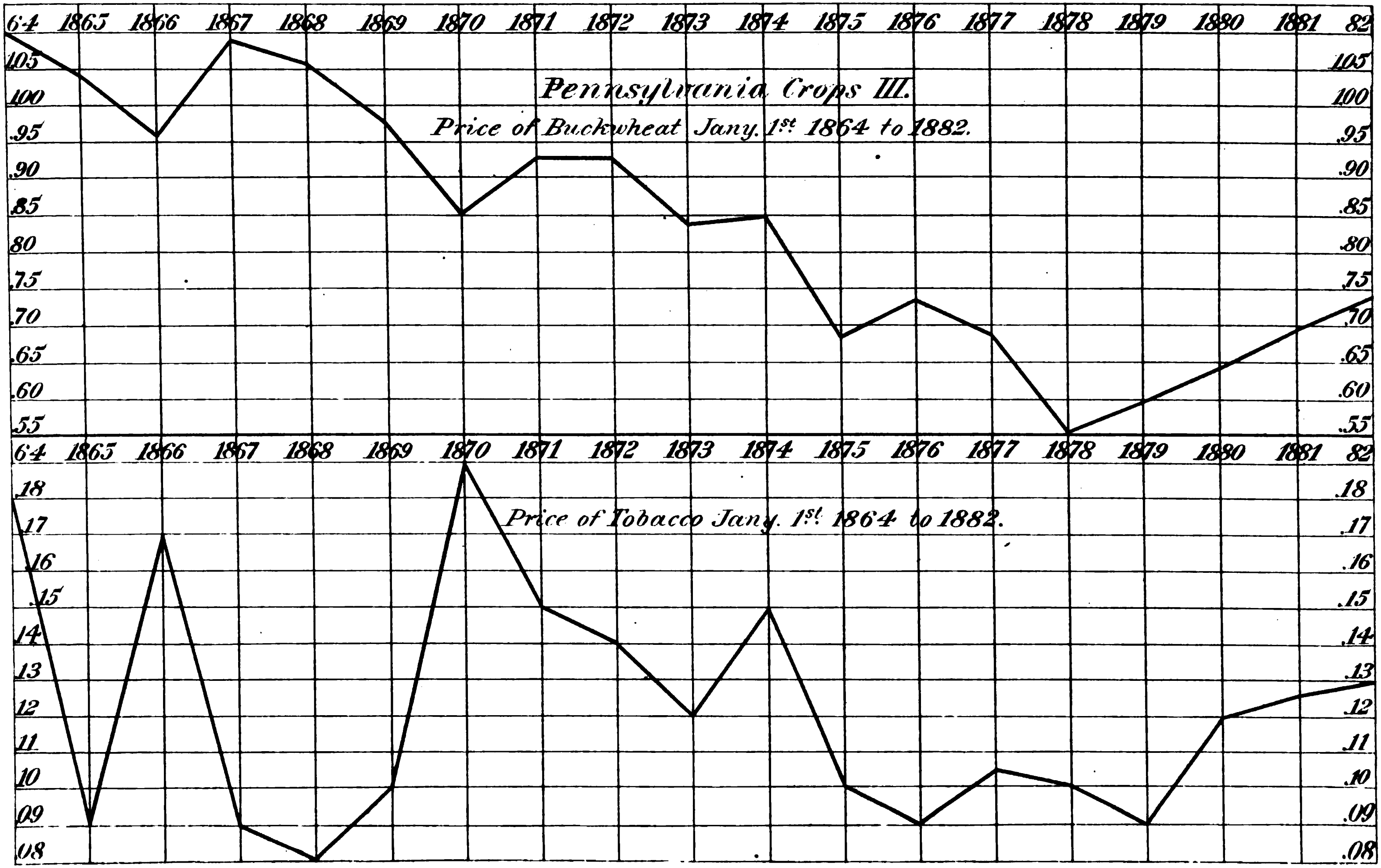
This reporter claims that his heifers calve soon after they are two years old, and will pay for their keep during their third year.

A Lehigh county reporter gives the following figures as regarding the cost of a cow at three years old:

First Year.—Calf at four weeks old,	$4 50
Pasture and skim milk,	6 00
Hay and meal,	9 00
Cost at one year old,	$19 50
Second Year.—Pasture,	6 00
Hay and fodder,	12 00
Cost at two years old,	$37 50
Third Year.—Pasture,	8 00
Hay and meal,	18 00
Cost at three years old,	$63 50
Credit by calf,	4 50
	$59 00

This correspondent claims that the heifer should not have a calf until three years old, and that her future increased value as a cow will more than pay for the extra cost.

In the same manner estimates of the cost of each kind of live stock were arranged in tabulated form for each county, with the result as exhibited in the following table:



Pennsylvania Crops III.

Price of Buckwheat Jany. 1st. 1864 to 1882.

Price of Tobacco Jany. 1st. 1864 to 1882.

Estimated Cost of Crops and Stock.

COUNTIES.	Wheat per bushel.	Corn per bushel.	Rye per bushel.	Oats per bushel.	Potatoes per bushel.	Hay per ton.	Clover seed per bushel.	Timothy seed per bushel.	Butter per pound.	Calves one year old.	Calves two years old.	Cows and steers three years old.	Horses three years old.
Adams,	$0 90	$0 41	$0 65	$0 27	$0 32	$6 00	$4 75	$1 90	$0 20	$15 00	$30 00	$45 00	$97 00
Allegheny,	97	33	60	29	30	6 12	4 50	2 00	24	12 00	26 00	45 00	90 00
Armstrong,	85	40	60	30	27	9 50	4 00	2 50	22	10 00	20 00	35 00	95 00
Beaver,	90	40	60	30	23	8 00	4 00	1 87	24	13 00	24 00	45 00	95 00
Bedford,	98	45	70	24	23	5 50	3 50	2 00	21	10 00	16 00	28 00	68 00
Berks,	1 00	40	65	27	37	9 50	5 00	1 75	21	10 00	20 00	32 00	80 00
Blair,	1 03	47	64	32	37	10 00	3 50	1 75	19	11 00	17 00	23 00	78 00
Bradford,	92	44	60	31	35	7 00	3 25	1 87	21	12 00	20 00	31 00	87 00
Bucks,	97	44	57	35	37	7 50	4 00	1 90	28	15 00	25 00	37 00	90 00
Butler,	89	33	64	24	31	7 25	4 10	2 00	23	10 00	15 00	27 00	87 00
Cambria,	70	37	45	24	24	5 50	3 50	1 75	13	10 00	19 00	29 00	67 00
Cameron,	87	33	69	26	30	6 50	3 75	1 75	20	10 00	18 00	29 00	84 00
Carbon,	73	37	45	27	32	7 00	3 75	2 00	20	10 00	18 00	30 00	67 00
Centre,	73	30	55	20	24	9 25	3 50	1 80	19	9 00	17 00	28 00	75 00
Chester,	1 10	40	50	26	27	9 00	4 00	1 75	23	12 00	24 00	39 00	73 00
Clarion,	79	44	65	24	26	9 00	3 25	1 50	20	9 00	16 00	29 00	70 00
Clearfield,	95	41	70	31	24	11 00	4 00	2 00	20	9 00	15 00	27 00	68 00
Clinton,	78	37	60	27	24	7 00	3 00	1 50	20	9 00	17 00	30 00	67 00
Columbia,	1 00	45	80	31	37	9 00	4 00	2 00	24	15 00	28 00	37 00	90 00
Crawford,	75	35	48	26	30	7 00	4 00	2 00	18	12 00	21 00	35 00	74 00
Cumberland,	87	40	58	24	22	7 50	3 10	1 75	19	9 00	17 00	31 00	73 00
Dauphin,	75	37	49	22	26	7 60	3 00	1 75	20	12 00	24 00	34 00	67 00
Delaware,	92	44	57	24	32	8 10	4 10	1 87	24	14 00	24 00	38 00	90 00
Elk,	96	44	61	28	24	7 15	4 00	1 75	20	10 00	19 00	27 00	80 00
Erie,	93	43	62	29	31	7 50	3 25	1 75	21	11 00	19 00	30 00	73 00
Fayette,	80	33	58	27	31	8 00	3 00	2 00	20	10 00	16 00	27 00	57 00
Forest,	80	33	41	24	27	9 00	4 00	2 50	18	9 00	13 00	29 00	54 00
Franklin,	78	37	65	27	30	6 10	3 50	2 12	19	8 00	14 00	27 00	74 00
Fulton,	87	40	63	25	25	7 50	4 75	2 16	17	9 00	15 00	23 00	63 00
Greene,	78	40	70	22	25	5 50	3 00	2 00	15	8 00	18 00	28 00	75 00
Huntingdon,	1 00	38	54	27	25	8 50	4 25	1 75	15	9 00	17 00	31 00	80 00
Indiana,	85	42	55	25	24	6 50	4 00	2 10	18	10 00	16 00	32 00	72 00
Jefferson,	78	49	60	25	23	8 75	5 00	2 00	18	8 50	16 00	29 00	67 00
Juniata,	87	37	50	24	24	9 00	4 00	2 00	14	10 00	20 00	31 00	65 00
Lackawanna,	75	38	55	23	20	9 00	4 00	2 50	24	12 00	20 00	31 00	72 00
Lancaster,	1 03	39	87	27	24	8 00	4 75	2 50	20	20 00	33 00	40 00	78 00
Lawrence,	80	30	65	21	24	5 00	3 75	1 50	22	11 00	21 00	33 00	85 00
Lebanon,	1 02	40	82	30	27	8 00	3 75	1 50	18	15 00	30 00	45 00	93 00
Lehigh,	1 00	38	55	30	22	6 00	3 75	1 50	20	12 00	20 00	36 00	85 00
Luzerne,	89	30	50	27	21	6 00	3 00	1 15	20	10 00	22 00	36 00	92 00
Lycoming,	98	33	74	23	24	8 00	3 75	1 75	13	11 00	20 00	36 00	78 00
McKean,	82	40	45	23	25	6 00	3 75	1 75	20	10 00	13 00	29 00	67 00
Mercer,	1 00	24	45	24	27	5 50	4 00	1 75	16	10 00	20 00	31 00	73 00
Mifflin,	92	38	58	30	31	10 00	3 25	2 00	16	12 00	21 00	35 00	92 00
Monroe,	78	33	48	27	22	7 00	3 00	1 50	18	10 00	21 00	30 00	67 00
Montgomery,	99	42	67	31	23	8 00	4 75	2 00	22	12 00	24 00	36 00	94 00
Montour,	65	30	55	25	22	9 00	3 00	1 75	18	9 00	21 00	32 00	62 00
Northampton,	87	41	67	24	22	8 00	4 00	2 00	27	9 00	21 00	33 00	90 00
Northumberland,	92	33	68	28	22	9 50	4 00	1 85	20	10 00	19 00	30 00	67 00
Perry,	1 04	37	55	22	24	7 00	3 50	1 75	15	9 00	20 00	31 00	85 00
Philadelphia,	1 10	49	60	30	42	12 00	5 00	2 50	23	15 00	30 00	47 00	105 00
Pike,	97	40	52	30	34	7 50	3 75	2 50	22	11 00	20 00	29 00	92 00
Potter,	1 15	42	60	32	32	8 00	3 00	1 75	20	12 00	20 00	32 00	87 00
Schuylkill,	92	41	56	24	26	10 00	3 75	1 75	20	12 00	20 00	32 00	85 00
Snyder,	86	40	65	24	25	6 00	3 00	1 50	18	12 00	18 00	27 00	65 00
Somerset,	85	39	60	23	24	6 00	3 00	1 75	15	12 00	19 00	26 00	90 00
Sullivan,	90	40	55	24	24	7 00	4 00	1 50	18	12 00	20 00	28 00	75 00
Susquehanna,	1 00	47	70	30	24	6 50	4 25	2 00	20	10 00	18 00	30 00	70 00
Tioga,	75	34	62	31	33	8 00	3 00	2 75	18	11 00	20 00	31 00	75 00
Union,	90	37	70	26	22	7 00	3 00	1 25	18	12 00	20 00	30 00	78 00
Venango,	1 00	49	87	28	27	7 00	4 00	2 25	17	13 50	20 00	32 00	63 00
Warren,	97	42	65	26	25	7 00	3 00	1 50	18	15 00	25 00	35 00	72 00
Washington,	75	35	70	25	23	8 00	3 00	1 50	20	12 00	24 00	35 00	72 00
Wayne,	86	41	76	23	25	7 00	3 50	1 75	17	11 00	19 00	30 00	76 00
Westmoreland,	82	23	70	31	24	10 00	3 50	1 75	22	12 00	27 00	38 00	87 00
Wyoming,	85	37	58	25	20	9 00	4 00	2 75	13	9 00	17 00	27 00	75 00
York,	75	32	52	24	22	6 00	4 00	2 75	14	10 00	13 00	29 00	65 00
	$0 85	$0 37	$0 60	$0 26	$0 27	$8 53	$3 60	$1 89	$0 20	$11 10	$20 00	$33 95	$79 00

KILLING INSECTS BY HAND.

By Prof. W. A. BUCKHOUT, *Entomologist of the Board.*

. Many ways of destroying injurious insects have been proposed, but it is evident that in each instance the peculiarities of the case in hand must determine the particular method to be employed.

In field culture some wholesale method is desirable. Many of those in use have proved very successful, and, in some cases, indispensable; but there are likewise many instances where simple hand picking is the only alternative, or the only method that is attended with much success. Hand labor in every industry has been so largely superseded by machine work, that there is a very prevalent dislike to anything which requires to be done by hand; and when killing insects by hand is said to be necessary, the business seems so small that many would prefer losing good crops of fruit or valuable trees rather than take the time and trouble needful to protect and save them. While Paris-green and London-purple have been very useful in keeping in check the Colorado potato beetle, there is nothing which will exterminate the apple tree borer, except a vigorous hunting after each larva as it shows its presence by the characteristic castings thrown out from its burrow. In very many cases nothing but the catching and destroying each insect as it appears will avail in protecting our gardens. It is idle to trust to luck in such matters, or to the insect proof character which some plants are reputed to possess. The relation between insects and plants is a mutual one, and seems to be of a very intimate character. Where plants are there are insects feeding more or less directly upon them. The greater the luxuriance of plants the greater the number and more vigorous the attacks of their insect enemies. That some plants have partial or even complete immunity from insect attack is, no doubt, true, but there is no telling when this immunity will cease, and some new or old insect take as readily to these plants as if they had been the natural food of generations of their kind. The pleasing fiction of no insect, with such a perverted taste as to like tobacco, has often done duty to keep youngsters from learning to use the weed, but our tobacco growers know to their cost how little foundation it has in fact. Insects, then, we have always with us, and the question how we shall destroy such as are an injury, and how protect those which do not harm us, or which aid us in destroying the injurious ones, becomes a very important question.

In that beautiful inter-dependence of living things which we see in nature, we can always learn something of advantage to us in practical life. We see, oftentimes, how great herds of insects, like the army worm, sweep in upon us with scarce a day's warning, while at another times such are the climatic changes that these same insects are well nigh blotted out of existence, and only a remnant remains to propagate their kind. Agencies, such as these, are at work continually keeping insects of all kinds in check, and preventing our being overrun by injurious species. Obviously such means are beyond our immediate control, but there are others, by some considered, to be of even greater importance which we can directly foster or increase. There are great numbers of insects which are parasites, which lay their eggs within the bodies of other insects. These in turn become so disabled that they do no further injury, but lead a brief, inactive life and then die, meanwhile setting free their inclosed parasites, which, having been well protected and furnished with food during their early stages, are now mature and ready to carry on propagation again. While many of these parasites are minute, and it would be impossible to do anything toward propagating or disseminating them, there are others which can be directly handled and distributed as they are required. In many cases, too, a knowledge of these parasites species will enable us to favor them whenever we see them. All species of insects are not injurious, and the difficulty with ordinary destructive agencies is that they destroy alike our friends and foes. I know of no way, however, of distinguishing injurious from beneficial insects except by acquiring through study and experience some knowledge of insects as a class, their structure, and mode of life.

With this as an aid one can act intelligently in the work; without it he must continue to act in the dark. So wide spread are the reports of our Government entomologists, and so numerous are the opportunities of acquiring such information, that any active, wide-awake farmer could, with a little effort, acquaint himself with the principal facts concerning our common insects, and thus be prepared to deal intelligently with them.

Designing to present more particularly the matter of hand-picking injurious insects, I pass over the very numerous other methods which have been used in combatting them. They have their use; but I am convinced that the apparently tedious process of picking and killing noxious species as they appear can be practiced to advantage much more frequently than it now is. "Prevention is better than cure" applies in garden economy as well as in any other, and rather than the plants become over-run with insect foes it is better, where practicable, not to allow them to get a foothold; but to see that they are gathered and destroyed before they have had time to do any injury themselves or to lay the eggs for another generation. In gardens or in small patches of potatoes it is not difficult to keep back, if not entirely out, the Colorado potato-beetle by going over the vines daily and picking the beetles as fast as they come to lay their eggs. Later, when egg-laying begins, the leaves upon which the eggs are placed can be broken off and the eggs destroyed; or, if the larva have hatched, they can be treated in the same way. This takes time, and it is not claimed that it can be profitably done in all cases, but that it is often practicable I have proven to my own satisfaction, having had potatoes absolutely free from the insects, while patches large and small within two hundred yards were badly injured by them. Potatoe beetles come in the spring of the year, not as do grasshoppers and army worms, in great swarms; but in small numbers. These soon propagate, and when the progeny are well established it is difficult to eradicate them by any means. The time to begin is when they first appear. Extra labor at this time will more than pay for itself by its effect afterward. Could such a systematic effort be made on the part of farmers as would destroy the few bulbs which hibernate and in the spring lay the eggs for the first crop of worms, the species would become extinct. The squash bug (*Corens tristis*) is a still better case in point. It does not show itself until summer has fairly set in. At first only the very few bugs that have survived the winter are to be seen. They can be easily caught or trapped, and then destroyed. The eggs, which are placed on the under sides of the leaves, are not difficult to find, and the young are, for some time, quite slow in their movements, and are so social as to be found close together. They are rather difficult to destroy by ordinary insecticides, which make it all the more important that they be attacked by hand. After mid-summer they increase so rapidly that it is not easy to raise squashes or melons where the bugs are allowed to have their own way. Another very annoying insect in our gardens is the green cabbage worm, the larva of Pieris rapæ. Though of rather recent introduction, it is now so common and destructive as to be well known. It is so nearly like the cabbage leaf in color that it is often difficult to see, yet a little practice enables one to pick them pretty rapidly. The eggs are laid singly, and are inconspicuous in size and color, hence it would not be worth while to attempt to do anything with them. Possibly something could be done by catching the butterflies in a net when they are laying; but this I have never tried. Picking the worms is the best way of destroying them. And here is shown the advantage of a little knowledge of insect economy. If the worms are taken when nearly grown, it will be found that a large part of them are parasitized. Often nine out of ten are so affected. If, then, all the larva are destroyed their parasites also are destroyed. Since the parasites are of such great value to us in keeping this insect in check, it follows that we should preserve them if possible. This can easily be done by keeping the worms in a box instead of immediately destroying them. Soon the parasites will have issued from the bodies of their hosts and spun their cocoons, in which they undergo their final metamorphosis. By doing this we shall have favored our friends while we have been destroying our foes.

In fruit culture, as in vegetable gardening, there are many cases where a few minutes every day devoted to killing insects is of far more value than the same number of hours after insects have got a firm hold. Though very many remedies have been employed for the plum curculio, the only really effective ones are those in which the curculios are picked one by one and destroyed. Generally, this is done to the best advantage by jarring the tree over a sheet, which has been spread on the ground beneath. Any one who will faithfully do this, killing the insects, and collecting the wormy fruit and feeding it to the hogs, so that the worms are eaten, can raise plums; and if all persons in a given neighborhood were to unite in such treatment, the plum curculio would be a rare insect. So with the codling moth and the apple-tree borer, those two great enemies of the apple. The former, when in the larva state, can be trapped by the well-known method of putting bands of straw or paper about the trunks of the trees and killing all the worms which seek shelter there. This requires frequent examination, but it is very effectual.

The apple-tree borer is, fortunately, still unknown in a large number of places. Such are its habits that it must be probed for with a hooked wire, and each larva drawn out of its burrow. Nothing short of this will avail after they have begun their attacks. Though this is a slow hand process, it is the only available one, and one which repays abundantly in the end. There would be no hesitation in undertaking this treatment, could the injury which this borer is capable of doing be foreseen. It destroys not the fruit, nor the leaves, or smal. branches, but aims directly at the tree itself.

As I write, I am in receipt of the well-known basket-worm, so destructive to evergreens. All the circumstances in the life history of this insect point to but one method of destruction which can be at all effective—that of picking and burning the "baskets" as fast as they are formed. A slow method, it is true, but a sure one. In short, there are scores of instances where freedom from the ravages of insects can be had only at the expense of vigorous and persistent attack by "hand power." No other method is as effective. The destruction of injurious insects is very much like the eradication of weeds, there is a time when it can be done with comparatively little effort. Should this time pass by unimproved, the multiplying insects may destroy the crop or render it of little value, just as noxious weeds choke the valuable plants, and render them not worth further care and attention.

I am moved to write in this way because a large number of the cases which come under my observation are of such a character that they can be handled most advantageously in this simple way. It behooves every one, then, who wants to raise perfect fruit, and have vigorous, healthy, ornamental plants, to be watchful, and note the first appearance of these insect foes, and speedily attack them before they have had time to gain a foothold, either for themselves or their progeny. Considering how quickly insects appear and reproduce during warm weather, this calls for almost daily examination of those plants known to be most subject to insect attack. Use the wholesale methods if you can, but if these will not answer, do not abandon all to the insects until you have tried what a hand-to-hand encounter can accomplish.

REPORT OF MICROSCOPIST AND HYGIENIST.

By HENRY LEFFMANN, M. D., *Microscopist and Hygienist of the Board.*

The following is a summary of the principal investigation made since the last report:

Tomato Rot.

In the summer of 1881, considerable interest was excited in a disease that was effecting tomatoes. The disease manifested itself on the nearly ripe fruit, at the apex, (that is opposite the attachment of the stem,) and spread from this point until a space an inch or more in diameter was effected, thus, of course, greatly injuring the tomato. I had the opportunity of seeing some specimens at the office of the Philadelphia *Record*, shortly after the publication of the notice of the disease in the news columns of that paper. In these specimens, the apex of the fruit was shrunken and blackened for a space the size of a half a dollar, and in most cases the diseased portion had run into decay, and was the prey of several forms of mold. Very little could, of course, be learned from these specimens, which were some days old, and in which, therefore, natural decay was merged with the results of disease. After some inquiry, I learned that opportunity for observing the condition in the living plant could be found near Merchantville, New Jersey, and I therefore visited that locality, and was fortunate enough to see the condition in various stages. My examination on the spot, and subsequently with the microscope, leads me to believe that the disease was one of nutrition, and was not due to the presence of an animal or vegetable parasite. The tomato as grown in New Jersey, in a sandy and dry soil, is forced in growth in order to secure it early for market, and in this manner its nutrition is disturbed. It was the earlier crop of fruit that was most seriously effected, and point at which the trouble began was, as already stated, at the apex, that is at the point furthest from the source of the nutrition juices. The season during which the trouble occurred was hot, and I came to the conclusion that the cause of the trouble was, that the plant, under its artificial and stimulated growth, was not able to keep the nutritive juices fully supplied to the extreme points of the stem, and those points therefore were shriveled and killed. Microscopic examination confirmed this, by showing the incipient condition to be simply the drying and shriveling of the cells. No fungus existed in the very first stage. As the dead tissue underwent the ordinary process of decay, various fungi established themselves, and presented, as in many other similar cases, the appearance of being the cause of the disease. In this view, it was obvious that no remedy could be suggested, except the cultivation, in the exposed and dryer situation, the varieties least liable to the trouble. The matter, however, was not serious; it has, I believe, shown no tendency to extend, and during the late summer has not attracted attention.

Ozone Powders.

The frequent allusions in scientific journals to ozone and its peculiar qualities has developed many crude and erroneous notions in the minds of the public at large. Unscrupulous persons have taken advantage of these ideas, and have put upon the market various preparations for preserving or disinfecting ozonic substances, which preparations are either mere humbugs, or if they have any value it is due to other influences than ozone. A company is now in operation in this city claiming to use ozone as a preservative: but my examination of articles preserved by it, leads me to believe that it uses only sulphurous acid, that is, the vapor that is produced by burning sulphur. Within the last year or so extensive notice has been given to so-called "ozone powder," which has been largely sold at high prices. A sample of this was sent to me, and I made a quantitative analysis of it. It contains about ninety per cent. of sulphur and ten per cent. charcoal. I believe that this substance has been sold to farmers and others at prices exceeding a dollar a pound. This fact shows how easy it is to impose upon people, and how important it is for persons not familiar with chemical points to beware of articles that pretend to accomplish wonders.

Vitative Compound.

A very peculiar substance was lately referred to me by the Secretary of the Board. It was called a "vitative compound," and was furnished in a package about two inches long and one inch square, at a price of $1 15 per package. The paper cover bore the following printed matter:

THE VITATIVE COMPOUND,
OR
Seed and Plant Invigorator.

This Compound is purely chemical in its character and effects, containing. in a condensed form, those ingredients so generally deficient in the soil, and yet so essential to the immediate and certain germination of the seed and the vigorous and rapid growth of the plant.

DIRECTIONS FOR USE.

Dissolve this material in sufficient water to immerse one half bushel of seed; then add the seed, and allow it to soak for thrity-six to forty-eight hours. Then use. It is poisonous to animals.

For further information, address
WAUGAMAN & Co., Blairsville, Pa, or
WAUGAMAN & Co., Pittsburgh, Pa.,
Price, $1 15.

Patented April 21, 1874.

On examination, I found it to be a very peculiar mixture. It yields to water a small amount of zinc sulphate, but the greater portion is insoluble in water and even in acid. This portion contains lead partly as lead sulphate. The mixture contains only traces of ammonia and organic matter. I do not see how it can have the sightest beneficial action on seeds.

THE MAINTENANCE OF FERTILITY.

By Prof. W. H. JORDAN, *Agricultural Chemist of the Board.*

Many erroneous ideas are prevalent concerning the nutrition of plants, and their relation to the soil and air—in fact not a little ignorance exists with reference to the most important principles in agriculture.

Many facts pertaining to the chemistry of plant growth have an intimate connection with farm practice in so far as it relates to the preservation or increase of the fertility of the soil. The object of this paper is to present in a concise form those facts and principles that the farming public is so constantly seeking, and which, in the absence of books of a certain class, they do not have at their command.

The farmer, taking advantage of the materials and forces that nature places at his command, is a producer of plants. Like the chemist, if his materials are of the right kind, in sufficient quantity and properly handled, he secures the results he desires; but a lack of material of the necessary kind, or a mistake in its use, is just as fatal in the one case as in the other. Now a great deal is known of the composition of plants and of the sources from which their substance is gathered. We are also in possession of many valuable facts concerning sterility and fertility of soil. Much has been learned about the action of manures of various kinds that is of great practical value. A large part of this knowledge is scientific in its character, and is therefore all the more practical, because of the manner in which it was obtained, viz: By careful and long continued investigations.

What Plants Contain.

Plants have been found to contain the following elementary substances, viz: Carbon, oxygen, hydrogen, nitrogen, silicon, sulphur, phosphorus, chlorine, iron, aluminum, calcium, magnesium, manganese, potassium, and sodium. Instead of using the names of the elements proper, we speak of some of the above substances as silica, sulphuric acid, phosphoric acid, lime, magnesia, potash, and soda, these being compounds of the above-named elements with oxygen.

Familiar substances consisting of these elements, or in which they are found, are as follows: Carbon is seen in the form of coal. Oxygen and nitrogen are the two principal constituents of air. Hydrogen is united with oxygen to form water. Silica is common quartz rock. Phosphoric acid is a principal constituent of bones. Chlorine and sodium unite to produce common salt. Sulphur and iron are very familiar substances. Caustic lime is a compound of calcium and oxygen, as the magnesia used medically is of magnesium and oxygen. Potash is contained in the commercial "potash," which is really carbonate of potash. Four of these elements—carbon, oxygen, hydrogen, and nitrogen—disappear in the air when a plant is burned, and all the others remain behind in the ash. Such is the case with wood or any vegetable substance.

Natural Sources of Plant Food.

No matter how luxuriantly a plant may grow, it is able to obtain all its carbon from the carbonic acid of the air, which enters the plant through the leaves. It is an erroneous idea to suppose that the carbonic acid of the soil is necessary for supplying the plant with carbon. The source of the oxygen and hydrogen is undoubtedly water, which enters the plant through the roots. Nitrogen can only be furnished to the plant in its compounds, principally ammonia and nitric acid. The free nitrogen of the air is useless as direct plant food. Nitrogen compounds enter the plant through its roots. Even the nitric acid and ammonia of the air must first be carried to the soil by rain before they can become useful. The soil contains at all times small quantities of ammonia and nitric acid. These compounds are being continually used by growing vegetation, and as continually supplied from the air and from decomposing organic matter, besides what comes from artificial sources. The mineral ingredients of a plant, such as sulphuric acid, phosphoric acid, lime, magnesia, potash, &c., come entirely from the soil, being taken up by the roots. There is no soil, unless it be of the most extraordinary character, that does not contain all the elements of plant growth in quantities that vary from a mere trace to a large percentage. So there is no soil that will not support vegetation of some kind, though it be ever so scanty.

The Indispensable Elements of Plant Growth.

It is very natural to suppose that whatever is found in a plant is essential to its growth and development. Such, however, is not the case. Plants have been grown to fullest perfection in water solutions that contained no silica, chlorine, sodium, or manganese, or only minute traces. The ten substances, the absence of any one of which would be fatal to plant growth, are carbon, oxygen, hydrogen, nitrogen, sulphuric acid, phosphoric acid, lime, magnesia, iron, and potash. Take every trace of phosphoric acid or potash out of a soil, and it would be as barren as pure quartz sand. The absence of one of the ten ingredients would be as fatal as the absence of all.

Relation of Demand and Supply.

The one important consideration in agricultural practice, is the relation of demand and supply of plant food. If there are certain materials the farmer must have in order to produce crops, it is of the utmost interest to him that he should know the extent of the supply that nature offers of the various constituents needed, and how this supply is able to meet the demands. Let us see what are the facts.

We can get some light on the matter under discussion by looking carefully at the composition of an average soil, and calculating what it would contain of the various necessary ingredients of plant food. The following figures show what was contained in a fine English wheat soil:

	Pounds in 1,000 of soil.	*Pounds in one acre to the depth of one foot.**
Silica,	715.5	2,502,500
Iron oxide,	51.7	182,000
Lime,	12.3	43,050
Magnesia,	10.8	37,750
Potash,	3.5	12,250
Sulphuric acid,	.44	1,540
Phosphoric acid,	4.3	15,050
Nitrogen, (average of analyses of several soils,)	2.2	7,700

Below is given a similar statement for a South Carolina soil, probably in poor condition:

	Pounds in 1000 of soil.	*Pounds in one acre to the depth of one foot.*
Silica,	885.9	3,100,650
Iron oxide,	8.3	85,050
Lime,	3.2	11,200
Magnesia,	1.37	4,795
Potash,	.06	210
Sulphuric acid,	.8	2,800
Phosphoric acid,	.59	2,065

We need but to glance at the above figures to see that whether we take the excellent wheat soil or the poor one from the south, the essential and most important ingredients are present in the smallest relative quantities. Now, while the analysis of ordinary soils tells very little as to their state of fertility, it shows us what compounds would be soonest entirely used, provided all the ingredients of the soil were in equal demand. And it is a fact, that none of the ingredients entering into a plant, excepting those that come from carbonic acid and water, are needed to any greater extent than is the case with nitrogen, phosphoric acid, and potash, substances that even the best soils contain in very small percentages. But we are not shut up to this method of ascertaining the explanation of soil exhaustion. We find that if we apply to a field producing scanty crops, a fertilizer containing nitrogen, phosphoric acid, and potash, in forms available for the use of plants, an increase of fertility follows. The only explanation of this is, that what has been supplied is that which was lacking of the ingredients absolutely indispensable. It is often the case, that lack of fertility is not due to a deficiency of plant food so much as to unfavorable mechanical conditions, presence of poisonous ingredients, &c. The carbon of the plant, as before stated, is taken from the air, and the supply is inexhaustible, for the reason that the amount used by vegetation is balanced by the quantity that passes into the atmosphere from combustion and from decay of organic matter.

Soil Exhaustion.

The explanation of soil exhaustion and its remedy can be epitomized in the following statements:

1. To grow fifty bushels of corn, a certain quantity of a certain number of ingredients is absolutely necessary.

2. The soil and air can always furnish a sufficient quantity of a part of these ingredients, while the supply of others in an available form may become exhausted.

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* Soil to depth of one foot estimated to weigh 3,500,000 pounds.

3. The essential materials for vegetable growth that the soil and air can always furnish in abundance, are oxygen, hydrogen, carbon and iron; sulphuric acid, lime and magnesia being very seldom wanting. So long as only minute quantities of silica and chlorine are needed, we have no occasion to fear but that any soil will meet all the demands that can be made for those substances. Inexhaustible stores of carbon exist in the air, and in decaying vegetable and animal matter; oxygen and hydrogen are as free as water, while it would be utter nonsense purposely to put iron in a fertilizer.

4. The substances of which plants most often find a scanty supply are nitrogen, phosphoric acid, and potash. A "run out" soil may lack one, two, or all of these in an available condition, but a soil is seldom found that fails in any other materials.

5. The main reason why substances called manure cause an increase of crop, is that they contain all or part of these valuable ingredients, nitrogen, phosphoric acid, and potash. This is true of both commercial and farm manures.

6. The chief value of any manure depends upon what it contains of these last-mentioned substances. It is not a question of bulk, color, odor, or any other condition save this, that chiefly determines the value of manures. Remove these three ingredients wholly from any manure, and it would be of very little value.

To say that a soil is exhausted, does not mean that any single element of plant food has been entirely withdrawn from it. Such is practically never the case. The failure of land to produce satisfactorily, comes at a point far short of the complete removal of any one of the necessary constituents. A field that would not produce over five bushels of wheat to the acre, may contain a hundred times more of every element of growth than would be needed for a luxuriant crop. Exhaustion means no available material rather than no material at all, and this fact has an important bearing upon the question of tillage.

Fertility, in the broadest sense of the term, includes more factors than the mere matter of soil exhaustion. Mechanical conditions, such as looseness or compactness, fineness or coarseness, a very loose sub-soil or an impervious sub-soil, often set a limit to production independently of the supply of plant food.

The points that we need to consider for a full understanding of our subject, are the following:

1. The extent and the manner of exhaustion which result from the selling of the various products of the farm.

2. The means of keeping up the productiveness of the soil. (*a*) By using what the soil already contains. Or, (*b*) By the application of manures.

The Valuable Ingredients Contained in the Various Products of the Farm.

The only method of determining how much is abstracted from the soil by any farm product is by chemical analysis. It has been found by this means about what are the percentages of valuable constituents that are contained in all kinds of vegetable and animal material. In the following table are given figures that allow the computation of the extent of exhaustion that occurs in the growth of the ordinary farm crops and in the sale of meat, milk, cheese, and wool. The quantities given are what are contained in one thousand pounds of the fresh or air-dried product:

KINDS OF PRODUCT.*	Nitrogen.	Potash.	Lime.	Magnesia.	Phosphoric acid.	Sulphuric acid.
Timothy,	13.5	20.3	4.7	1.9	6.9	1.7
Clover,	19.7	18.6	20.1	6.3	5 6	1.9
Green fodder corn,	1.9	3.7	1.4	1.1	1.0	0.3
Potatoes,	3.4	5.8	0.3	0.5	1.6	0.6
Fodder beets,	1.8	4.8	0.3	0.4	0.8	0.3
Sugar beets,	1.6	3.8	0.4	0.6	0.9	0.3
Turnips,	1.8	2.9	0.7	0.2	0.8	0.7
Wheat, (kernel,)	20.8	5.2	0.5	2.0	7.9	0.1
Rye, (kernel,)	17.6	5.8	0.5	2.0	8.5	0.2
Barley, (kernel,)	16.0	4.7	0.6	2.0	7.8	0.4
Oats, (kernel,)	19.2	4.8	1.0	1.9	6.8	0.5
Corn, (kernel,)	16	3 7	0.3	1.9	5.7	0.1
Field beans, (kernel,)	40.8	12.9	1.5	2.2	12.1	1.1
Wheat straw,	4.8	6.3	2.7	1.1	2.2	1.1
Rye straw,	4.0	8.6	3.1	1.2	2.5	1.6
Barley straw,	6.4	10.7	8.3	1.2	1.9	1.8
Oats straw,	5.6	16.3	4.3	2.3	2.8	2.0
Maize straw, (stover,)	4.8	16.4	4.9	2.6	3.8	2.4
Tobacco leaves,	34.8	40.9	50 7	10.4	6.6	8.5
Cow's milk,	5.4	1.7	1.7	0.2	2.0	0.1
Cheese,	51.2	6.6	17.7	1.2	19.2	0.1
Live ox,	26.6	1.7	20.8	0.6	18.6	
Live sheep,	22.4	1.5	13.2	0.4	12.3	
Live swine,	20.0	1.8	9.2	0.4	8.8	
Wool, unwashed,	54.0	56.2	1.8	0.4	0.7	
Wool, washed,	94.4	1.9	2.4	0.6	1.8	

By the help of the above table we are able to estimate approximately the loss incurred in sending away from the farm the salable produce of one acre. Only the quantities of the three most valuable substances are given:

ESTIMATED CROPS.	Nitrogen.	Phosphoric acid.	Potash.
	Lbs.	*Lbs.*	*Lbs.*
Timothy hay, (2 tons,)	54	27.6	81
Clover hay, (2 tons,)	78.8	22.4	74.4
Green fodder corn, (15 tons,)	57.0	30	111
Potatoes, (150 bushels without tops,)	30.6	14.4	52.2
Fodder beets, (20 tons,)	72	32	196
Sugar beets, (20 tons,)	64	36	152
Wheat, (25 bushels without straw,)	31.2	12	7.8
Wheat, (25 bushels with 1¼ tons straw,)	43.2	17.5	23.5
Oats, (40 bushels without straw,)	23	8.2	5.8
Oats, (40 buchels with 1¼ tons straw,)	37	15.4	46.5
Corn, (50 bushels without stover,)	44.8	16	10.4
Corn, (50 bushels with 1¼ tons stover,)	56.8	25.5	51.4
Milk of ten cows, (40,000 pounds,)	216	80	68
Cheese from ten cows,	200	37	13
Pure butter fat from ten cows,	00	00	00
One steer weighing 1,000 pounds,	26.6	18.6	1.7

The above figures are not intended to show the amounts of nitrogen, phosphoric acid, and potash needed for the growth of the whole plant, but simply what would be removed in the parts that could be sold. It is easy to see that different crops exhaust the soil very differently. For instance, the amount of potash removed by root crops is very large; and land in Germany that had grown sugar beets for years, became "beet sick," a disease that was cured by the use of potash salts. Grain, whether wheat, oats, or corn, removes in the kernel most of nitrogen and least of potash, while in the straw, potash preponderates.

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*These figures are taken from *Mentzel und V. Lengerke's Landwort Kalender for 1882.*

It is commonly remarked by farmers, that timothy is more exhaustive than clover, and oats more than wheat, but neither statement is true. The effect that the growth of any crop has upon the one that succeeds it, should not be taken as a measure of the amount of soil exhaustion.

It must also be borne in mind, that the amount of any substance that a plant takes up, is not a measure of the difficulty with which it obtains the material. For instance, an acre of land would need to contain more available nitrogen in order for twenty-five bushels of wheat to be grown, using about thirty-one pounds of nitrogen, than would be necessary for the growth of two tons of clover hay, using nearly eighty pounds of nitrogen. In other words, clover can gather nitrogen more easily than wheat.

A study of the first table reveals one fact of great moment to the farmer. It is plainly shown that it makes a great difference as to the form in which a farmer sells his surplus productions, if he would husband the resources of his land. In selling an ox weighing one ton, only as much nitrogen is sent from the farm as would be lost by selling about one and one half tons of English hay. Of phosphoric acid, such an animal represents an amount found in less than five tons of hay, while an eighth of a ton of hay would furnish the ox with all the potash he has in his body. If the farmer were to sell the hay and grain necessary to be used in the production of two thousand pounds of live animal weight, he would send from his farm vastly more of those substances that have a manurial value, than if the animals had been grown and the manure returned to the land from which the hay or grain was taken. It will be seen later, that when food passes through an animal, only a small portion of its nitrogen, phosphoric acid, and potash is retained, while a larger part of these substances passes into the manure. Unless a farmer buys manure, the method of farming surest to retain or increase the fertility of his fields, consists in the production of meat or butter.

Selling milk or cheese would economize the resources of the farm to a less extent, while the most wasteful course of all to pursue, is the selling of crops as such. Any man's method of farming must depend very largely upon his locality and other circumstances. Any method that results in the impoverishing of the soil is unwise and often ruinous, even as a temporary expedient.

We come now to the question of the means of keeping up the supply of available plant food.

PLANT FOOD FROM NATURAL SOURCES.

In the case of nitrogen, nature makes a partial return for what vegetation takes, by means of rain water which absorbs ammonia and nitric acid in its descent through the air. But this amounts to less than ten pounds of nitrogen per acre for each year, a quantity much less than the average amount carried off by crops, as can be seen by the last table given. Phosphoric acid and potash do not have any source outside the soil save what is supplied by the farmer. Now we have seen that a soil may contain several thousand pounds of nitrogen, phosphoric acid, and potash, and still be unable to produce a satisfactory crop of wheat containing less than one hundred pounds of each of these ingredients. In a majority of cases, if such land be fallowed, its productiveness for the succeeding year will be increased.

Fallowing.

Fallowing, then, is one of the means adopted for keeping up the crop-growing capacity of land. The unfortunate thing about it is that it adds nothing to the soil, but is an expedient adopted for the more complete use of what is already there. Fallowing promotes decomposition. Land turned up in furrows and submitted, in a naked condition, to the action of the sun's heat, of the air, and of rain, meets with certain changes that make available material previously not at the command of growing crops. Moreover it allows an accumulation of plant food, for there is nothing to use this as fast as it becomes available. In the true sense, however, fallowing is exhaustive. In one way it is wasteful, for, to say nothing of the land lying idle, there is a greater loss of nitrogen by the leaching away of nitric acid, than is the case when vegetation stands ready to use this compound as soon as formed. There is some land in Pennsylvania that is so poor, either naturally or by cropping, that, unless manured, it needs to remain idle about two years out of three in order to accumulate sufficient available plant food to insure the growth of a paying crop. Fallowing, be it for one season or for several, does not belong to a system of high farming, and can hardly be recommended on any but the cheapest lands.

Another method of making drafts on the reserve stock of material in the soil is by the use of

Lime.

Lime is in no sense a true fertilizer. We generally use it, not because there is a lack of it in the soil for the purposes of plant growth, but as a decomposing agent. Some speak of lime as an "amendment," but it is not often even that, though it may sometimes serve to increase the absorptive properties of the soil. It is not strange that when an increase of production has been seen to follow an application of lime, it has been supposed that the soil was supplied with some needed element of fertility, when, in reality, nothing was done but the bringing into use material not previously in an available condition. The exclusive use of lime in the production of crops will finally be destructive to fertility, even on our best farming lands, and an ignorance of this fact has been of great harm to much of Pennsylvania agriculture. Liming is a correct practice only on farms receiving constant applications of yard manure. The decomposing effect is here needed to break down organic matter which has a tendency to remain in an inert condition.

Clover and Plaster.

The use of clover as preparatory to the wheat crop, is, as carried out in many parts of the State, still another road that leads finally to exhaustion of the soil. This statement may be a matter of surprise to some. It is not intended to convey the impression that clover should not enter into the rotation, for it is a valuable auxilliary to profitable farming. What is meant is that the farmer who places his main dependence upon clover to furnish his wheat with material for growth, will eventually come to grief. When the remark is heard, "I can't grow wheat now, for I can no longer get a catch of clover," it can be set down that the speaker is tilling fields exhausted by the very use of that which he laments as no longer at his command. Clover adds nothing to the soil save the carbon taken from the air. The nitrogen, phosphoric acid, and potash that enter into its composition, it obtains from the soil as do other plants. Of these three ingredients, clover roots contain a good percentage, and when the sod is turned over, and these roots decay, the wheat plant finds, ready for use, food that otherwise it would need to gather for itself, which, in many cases, would be impossible. When the wheat is gone the field is the poorer by the amount of valuable ingredients that the crop contains, for the soil was their original source. The use of plaster to help the clover, and so indirectly to help the wheat, is but an aggravation of the offense. Plaster contains sulphuric acid and lime, but no nitrogen, phosphoric acid, or potash. Its effect is somewhat analagous to that of lime, because it helps make a larger use of that which the soil already contains. Its usefulness in gathering and retaining ammonia has probably been exaggerated. Lime, plaster, and clover are a part of good farming in connection with real fertilizers, but as a sole dependence their use is simply putting off the evil day.

The second and most important division of our subject is that of obtaining

PLANT FOOD BY THE USE OF MANURES.

Manures are of two general classes, commercial and those produced on the farm. Both are of importance, and both demand careful consideration.

Commercial Manures.

We have in our markets a class of substances known as commercial fertilizers. Whenever they are of value, they contain one or more of the ingredients of plant food that have been pointed out, as especially liable to be lacking in the soil, in a form available to plants. In all first-class commercial manures these ingredients exist in quite large percentages; they are contentrated as compared with farm manures. While there would be three hundred and twenty pounds of phosphoric acid in a ton of first-class dissolved bone, (superphosphate,) in a ton of farm manure from good hay, there would be only four or five pounds. Dried fish scraps would contain per ton, one hundred and fifty to one hundred and sixty pounds of nitrogen, if of good quality, but not over a dozen pounds of that ingredient could be found in a ton of stable manure from the best of hay. Condense animal excrement by ridding it sufficiently of its large quantities of carbonaceous material and water, and it would then approach in character the fertilizers of our markets. Commercial manures are, or ought to be, concentrated plant food.

Classes of Fertilizers.

The fertilizers called "commercial," are made up of various classes, according to their principal ingredient. They are nitrogenous, phosphatic, or potash manures, according as they contain principally nitrogen, phosphoric acid, or potash. Some fertilizers cannot be distinguished by either of the above names, because they are made up of a mixture of two, or all of the three valuable ingredients.

Below are given the names of most of the principal manures sold in our markets, arranged in classes as indicated above:

Nitrogenous Manures.	Phosphate Manures.	Potash Manures.
Nitrate of Soda, (Chili saltpeter.)	Superphosphates.	Sulphate of Potash.*
Sulphate of Ammonia.	Phosphatic guanos.	Muriate of Potash.*
Fish Scrap, (fish guano.)	Bone meal.	Unbleached wood ashes.
Dried blood.	Bone ash.	
Meat scrap.	Bone black.	
Horn dust.	Phosphatic rock.	* *Potash salts.*

Sources and Character of the Various Fertilizers.

Perhaps a brief description of the sources and character of the commercial fertilizers in most common use may not be out of place.

Nitrate of soda, or Chili saltpeter, is obtained from the immense beds of that substance found in South America. The nitrogen exists in it as nitric acid, (the *aqua fortis* of commerce,) and is united to soda. In the saltpeter used medicinally the nitric acid is united to potash instead. Nitrate of soda should contain 15 to 16 per cent. of nitrogen, unless largely diluted with some other substance. It is very easy to do this with common salt, and the fraud escapes detection by any ordinary method of examination. As common salt is much the cheaper material there is a strong temptation to such dishonesty. The nitrogen purchased in nitrates costs more per pound than when bought in any other form. In such combinations it is in a condition to be immediately used by plants. It should be remembered, however, that the soil has but little power of retaining nitric acid, and, therefore, when nitrogen is used in this form it should not be applied to the land very long before it is to be used by the growing crop, else it may be leached out and carried off in the drainage water.

Sulphate of ammonia is obtained from the waste products of gas manufacture. The nitrogen, in the form of ammonia, is combined with sulphuric acid, (oil of vitriol,) and costs less than when bought in Chili saltpeter, being valued by the Connecticut Experiment Station at three and one half cents less per pound. A good sample of sulphate of ammonia should contain 20 per cent. of nitrogen; but, like nitrate of soda, it can be easily adulterated with several cheaper substances. Ammonia is not leached from the soil like nitric acid, only to the extent that it is oxidized and converted into the latter; therefore, its application some time previous to the time of planting or sowing is not so dangerous as it would be to use nitrates in such a manner. It is probably advisable, however, to apply both forms of nitrogen in the spring.

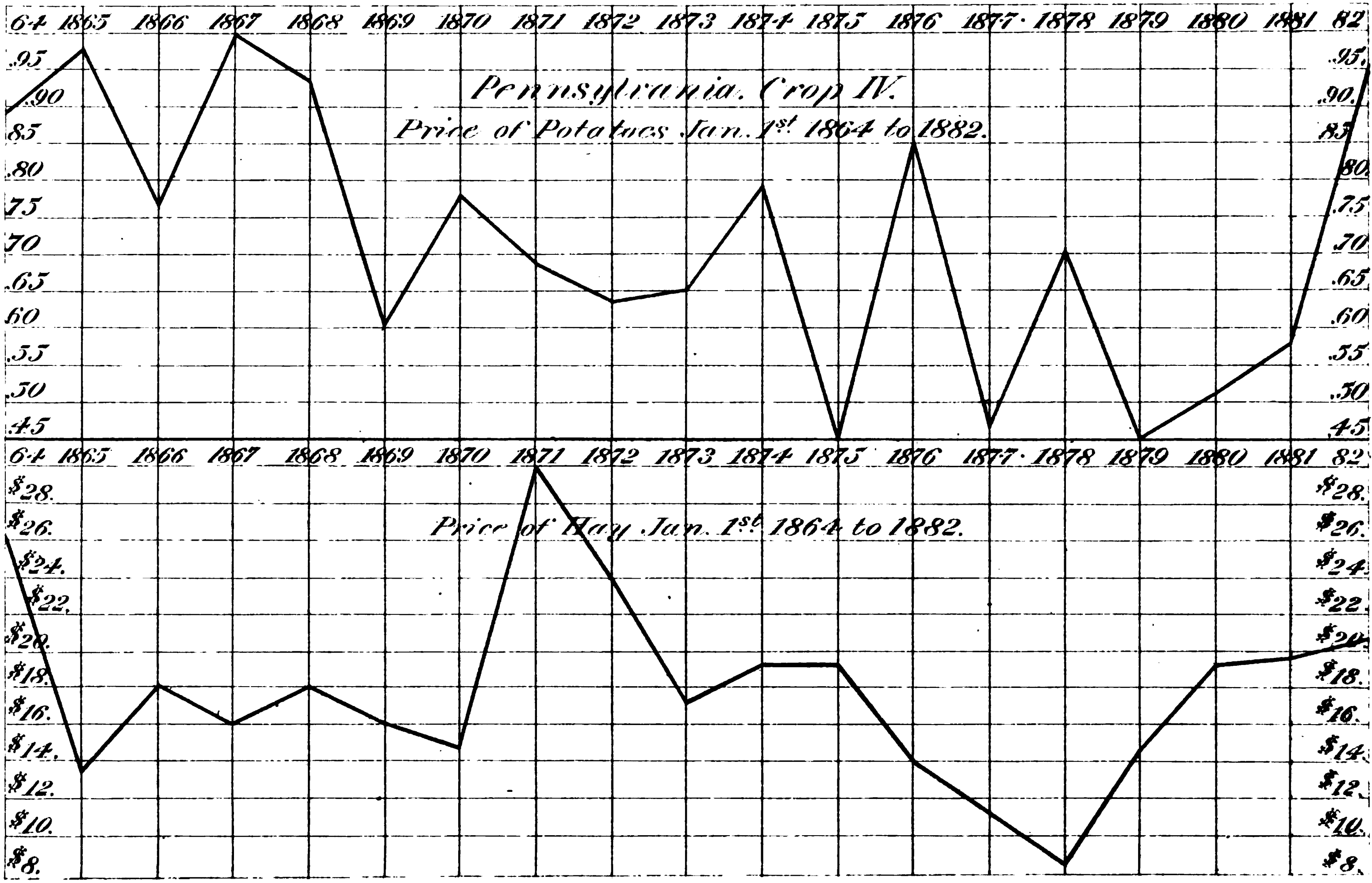
Dried blood, dried fish, meat scraps, and all animal substances contain nitrogen in the organic forms in which it was built up in the animal body. When in such combinations, it cannot serve as plant food until a certain amount of oxidation or decomposition has taken place. The various organic substances in the market differ very much in the ease and rapidity with which they decompose and render available their nitrogen in the form of ammonia or nitric acid. This transformation takes place rapidly with dried blood, fish, and meat; but slowly with hair, horn, and leather waste. This important difference has an effect upon the price and upon the methods of using such nitrogenous fertilizers. Such materials as horn dust, leather waste, &c., would be of value to a crop if applied to the soil long enough before the crop is grown to allow considerable previous decomposition; so that while it may not be an incorrect practice to manure a piece of land with dried blood just before it is sown to wheat, any substance resembling horn should be applied some months previous. A very good method of effecting the decomposition of animal substances that do not readily pass through such a process is to compost them. By this means their manurial value is more quickly and profitably utilized. More or less insoluble phosphoric acid is contained in the above mentioned organic manures, which slowly becomes available. In acidulated fish the phosphoric acid is to an extent soluble as in a superphosphate. Nitrogen in the organic form varies in price according to the substance containing it, costing in fish scraps and horn only three fourths what it does in dried blood and meat. In any case a finely powdered fertilizer of this class would in justice bear a higher price than one very coarse. Certainly the agricultural value is increased by fineness of division.

Superphosphates contain phosphoric acid as their principal ingredient. They are manufactured by treating some form of bone or phosphatic rock with oil of vitriol. Part of the phosphoric acid is thus rendered soluble in water, the amount of this depending upon the quantity of oil of vitriol used. A portion of the bone or rock is not acted upon; but this amount need be very small. The larger part should have its phosphoric acid rendered soluble. Besides the "soluble" and "insoluble" forms of this ingredient, we have in nearly all superphosphates a form called "reverted." This name applies to the phosphoric acid that was at first rendered soluble in water, but by chemical change has become insoluble in that liquid. Its chemical and molecular conditions give it a value greater than though it never had been soluble. Its value, as compared with that which remains soluble, is not determined; some experiments seeming to show that it is of equal value. In the market, however, it takes a lower valuation. Superphosphates made from ground phosphatic rock, (usually phosphorite,) are more likely to contain reverted phosphoric acid than those made from bone, owing to the influence of the iron and alumina compounds in the rock. Moisture also has a tendency to cause reversion.

The commercial values of the different forms of phosphoric acid, soluble, reverted, and insoluble, diminish in the order mentioned. The insoluble is valued in price according to the form and condition of the substance containing it. When in bone, its value varies with the fineness of the bone. It is worth the least in ground rock. It is well known that superphosphate has a much more immediate effect on crops than bone or phosphorite that has not been treated with oil of vitriol. This results from the solubility of the phosphoric acid in the superphosphate—at least, that is the explanation offered. But how is it that solubility is able to affect the value of this ingredient? Is it simply because that when soluble, it remains so in the soil and can thus be readily taken up by plants? Not at all. Phosphoric acid when applied to the land in a superphosphate, remains soluble but a very short time. The lime, iron, and alumina compounds in the soil soon precipitate it over the particles of earth, but in a very finely divided condition, so that the soil—water, and roots are enabled to make a solution sufficient for the use of growing plants. Solubility seems desirable, chiefly, as a means of obtaining an extensive, even, and intimate mixture of the phosphate with the soil.

From the facts just stated, it would seem that the finer bone is ground, the more nearly will its effect compare with that of superphosphate, so far as the phosphoric acid is concerned. Differences in the value of bone, according to its degree of fineness, are recognized by the Connecticut experiment station.

Nevertheless, bone meal is not a manure that generally causes a large increase of growth the first year of its application. At the same time its phosphoric acid is the most valuable of any that can be obtained in the insoluble condition. It is not advisable to apply bone meal to land, when the full benefits of it are desired at once. It is most rationally used where a gradual, lasting effect would be profitable. An admirable way to utilize bone meal or even ground phosphatic rock, when a farmer has land that responds to phosphoric acid, is to mix it with a fermenting manure or compost heap. The carbonic acid generated in a pile of moist decaying organic matter, is able to bring into an available condition a portion of the phosphates, which action in the case of the bone meal is aided by the fermentation communicated to it.



Pennsylvania. Crop IV.

Price of Potatoes Jan. 1st 1864 to 1882.

Price of Hay Jan. 1st 1864 to 1882.

No farmer should ever buy bone black to apply to the land as such, for it is very slow in giving up its phosphoric acid, owing to the presence of carbon, which protects the particles of phosphate from decomposing influences. Phosphatic rock is still slower in allowing its phosphoric acid to become available. The application of any phosphate that has not been treated with sulphuric acid, cannot be depended upon to cause a large increase of crop the first year. The matter of home-made superphosphate is one of some importance. It is manufactured on a small scale by some farmers. Bones can be purchased before they are ground, for a cent a pound; bone meal costs nearly two cents per pound. If one lives near a bone-mill, and can get the bones, it is a much cheaper way to purchase them and have them ground, than to pay thirty-five dollars per ton for no better bone meal. When a small quantity of superphosphate only is desired, it is doubtful if it is wise to take the trouble of manufacturing it; if one has a demand for several tons, it is another matter. It is wise, however, to save all the bones that collect about the house; purchase all that can be conveniently obtained from the neighbors, and then after they are crushed, put them in the compost heap or in moistened ashes.. Do not burn them, as they contain considerable nitrogeneous material that is valuable. Bones decompose more quickly if the fat is extracted by steaming.

The idea of obtaining phosphoric acid cheaply, by purchasing its insoluble forms and submitting them to the action of a compost heap, is undoubtedly a practical one for a farmer, who finds that his soil needs that ingredient. A pound of insoluble phosphoric acid can be purchased for three and a half to five cents, costing twelve and a half cents when bought of the manufacturers in a soluble condition. If the consumer can get the same effect without paying the extra cost, it is exceedingly wise to do so.

Potash manures come largely from Germany in the shape of potash salts. We have also potash that is extracted from ashes, but it is not used in this form as a fertilizer. The German potash salts are mined, and exist at first associated with other minerals. They are purified and sent to this country in quite large quantities. The substances found associated with them are common salt, and the sulphate and chloride of magnesia. These compounds are not always sufficiently removed from the imported potash manures, and while the common salt and sulphate of magnesia do no harm, chloride of magnesia in any considerable quantity is actually poisonous to plants.

For this reason it is well to apply potash salts, especially the chloride, to the land, some little time before the seed is put into the soil, so that the poisonous compounds, if present, can become sufficiently diffused to prevent harmful results. The sulphate of potash is the safer manure to use, but it is more costly than the chloride, (muriate.)

Unleached ashes contain quite a percentage of potash, which varies much according to the wood from which the ashes come, and the manner of burning. The potash in wood ashes is in a valuable form, (the carbonate,) and usually can be bought as cheaply in this as in any other form, if we take into account the phosphoric acid and lime which the ashes contain besides.

Good hard wood ashes from wood burned in fire-places or cooking stoves, are well worth twenty-five cents a bushel to any farmer, if he finds that his farm needs potash. The question is often asked, what is the difference between leached and unleached ashes, and which is the cheaper at ordinary prices? The chief difference is that the former contain much more potash than the latter. The process of leaching takes out nearly all the potash.

Now as to which kind a farmer had better buy, depends upon what he wants of the ashes. If his land needs potash manures, then he had better buy the unleached; but if he wishes to use the ashes simply as a means of liming his land, then the leached will serve his purpose just as well and be much cheaper. The manner in which a farmer is to learn whether he needs potash, lime, or any other ingredient applied to his fields, we will consider later.

The Commercial Value of Fertilizers.

No one can tell the value of a superphosphate by its color or odor. Not even by applying it to the soil can its *commercial* value be told, only its value to the man who uses it. It may do no good in one case and much good in another, but neither test can determine what it is worth in the markets. That is determined by the demand and supply. The commercial value of any particular fertilizer depends upon its composition, and that the chemist must discover. We need in Pennsylvania a station where the fertilizers offered in our markets can be analyzed. Such a plan would save thousands of dollars to the farmers of the State. In Connecticut, such a station has effected a great change in the fertilizer business, so that farmers there now buy their fertilizers at twenty-five per cent. cheaper than before the station was established.

In order to substantiate the above statements, the following is inserted, taken from the first annual report of the Connecticut Experiment Station, (1876:)*

"Among the commercial fertilizers analyzed during the past year were some thirty-five samples of articles sold outside of the supervision of the station, mostly in 1875, before its establishment, and some seventy-seven samples sold in 1876, under its supervision. The number of these articles seems ample, and the range in quality is certainly wide enough to afford a fair exhibit of the effect of the supervision exercised by the station. Basing the comparison upon the cost of the valuable ingredients, as determined from composition and selling prices, it stands as follows:

VALUABLE INGREDIENTS.	AVERAGE COST PER POUND.	
	In fertilizers sold before establishment of Station.	In fertilizers sold under supervision of Station.
Nitrogen,	47.00 cents.	23.00 cents.
Soluble phosphoric acid,	18.00 cents.	13.98 cents.
Insoluble phosphoric acid,	11.36 cents.	5.51 cents.

If, instead of taking the fertilizers all together, we select a single class, and one of the most important ones, the nitrogenous (ammoniated) phosphates, the comparison will stand as follows:

VALUABLE INGREDIENTS.	AVERAGE COST PER POUND.	
	In fertilizers sold before establishment of Station.	In fertilizers sold under supervision of Station.
Nitrogen,	59.4 cents.	24.9 cents.
Soluble phosphoric acid,	19.5 cents.	15.1 cents.
Insoluble phosphoric acid,	21.1 cents.	5.6 cents.

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* By Prof. W. O. Atwater.

In brief, the average actual cost of the fertilizers sold under the supervision of the station is less than half that of those sold before the station was established."

Just how valuations are made by experiment stations, and what are the advantages derived from them, can best be shown, in part, by some extracts from the Connecticut Experiment Station report for 1881.*

First comes a list of prices which are as near as possible to those ruling with standard articles sold at fair prices.

"The average trade-values or cost in market, per pound, of the ordinarily occurring forms of nitrogen, phosphoric acid, and potash, as recently found in Connecticut and New York markets, and employed by the station during 1880, have been as follows:

Trade-Values for 1881.

	Cts. per lb.
Nitrogen in nitrates,	26
Nitrogen in ammonia salts,	22½
Nitrogen in Peruvian guano, fine steamed bone, dried and fine ground blood, meat, and fish, superphosphates, and special manures,	20
Nitrogen in fine ground bone, horn, and wool dust,	15
Nitrogen in fine medium bone,	14
Nitrogen in medium bone,	13
Nitrogen in coarse medium bone,	12
Nitrogen in coarse bone, horn shavings, hair, and fish scrap,	11
Phosphoric acid soluble in water,	12½
Phosphoric acid "reverted" in Peruvian Guano,	9
Phosphoric acid, insoluble, in fine bone and fish guano,	6
Phosphoric acid, insoluble, in fine medium bone,	5½
Phosphoric acid, insoluble, in medium bone,	5
Phosphoric acid, insoluble, in coarse medium bone,	4½
Phosphoric acid, insoluble, in coarse bone, bone ash, and bone black,	4
Phosphoric acid, insoluble, in fine ground rock phosphate,	3½
Potash in high grade sulphate,	7½
Potash in low grade sulphate and kainite,	5½
Potash in muriate or potassium chloride,	4½

These "trade-values" of the elements of fertilizers are not fixed, but vary with the state of the market, and are from time to time subject to revision. They are not exact to the cent or its fractions, because the same article sells cheaper at commercial or manufacturing centers than in country towns, cheaper in large lots than in small, cheaper for cash than on time. These values are high enough to do no injustice to the dealer, and accurate enough to serve the object of the consumer.

To estimate the value of a fertilizer we multiply the per cent. of nitrogen, &c., by the trade-value per pound, and that product by 20. We thus get the values per ton of the several ingredients, and adding them together we obtain the total estimated value per ton."

"The uses of the 'valuation' are, 1st, to show whether a given lot or brand of fertilizer is worth, as a commodity of trade, what it costs. If the selling price is no higher than the estimated value, the purchaser may be quite sure that the price is reasonable. If the selling price is but $2 to $3 per ton more than the estimated value it may still be a fair price, but if the cost per ton is $5 or more over the estimated value, it would be well to look further. 2d. Comparisons of the estimated values and selling prices, of a number of fertilizers, will generally indicate fairly which is the best for the money. But the 'estimated value' is not to be too literally construed, for analysis cannot always decide accurately what is the form of nitrogen, &c., while the mechanical condition of a fertilizer is an item whose influence cannot always be rightly expressed or appreciated."

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* By Dr. S. W. Johnson.

The excuse for making such copious extracts from Dr. Johnson's report is that the matter is one of importance, as it can be shown that there is a legitimate and effectual method of controlling the prices of commercial manures, so as to keep them within reasonable limits. In most cases, where the price asked for a fertilizer is too large, it is only by a few dollars per ton. Occasionally monstrous frauds are detected. In the report for the Connecticut Experiment Station for 1876, an analysis of one fertilizer is given where the nitrogen it contained was costing the consumers $1.90 per pound, and the phosphoric acid fifty-four cents. Another fertilizer, costing $48 per ton, was found to be worth not far from $13.

What has been written should not prevent any farmer from buying commercial fertilizers because afraid of getting cheated. A much more sensible act is to set about procuring a means of protection. As it is, buy only of reliable parties those fertilizers that have stood the test of examination by our experiment stations. There is no doubt that the compounded fertilizers of some particular firm are generally more costly than when the ingredients are purchased separately and compounded by the farmer.

The Use of Commercial Manures.

The question, Is it profitable to purchase commercial fertilizers? is a very common one. In attempting a partial answer we shall first make the statement that the profits of raising crops by the use of such manures depend very much upon the kind of fertilizers purchased, and upon the methods adopted in their application. It is hard to understand why the valuable ingredients of plant food, as applied in the manures called commercial, should be any less valuable or effective than when carried to the soil in manures manufactured on the farm. There is no reason why phosphoric acid that is available in a superphosphate should be worth very much more or less than that which is available in the fermented excrement of animals. The same would hold true in comparing nitrogen and potash as contained in the two kinds of manures. But is there no difference between yard manure and commercial fertilizers? Now, so long as farmers must use manure of some kind, and as many buy it, either as made from the excrement of animals or in the form of concentrated fertilizers, an answer to this inquiry is deemed pertinent to the question of the profits resulting from the use of the latter.

1. Farm manures contain all, while commercial fertilizers may contain only a portion of the ingredients which plants use for food. Stable manure can thus be seen to be one that is pretty sure to meet the demands of plants, which is, in one sense, an advantage. But if a farmer were to find it profitable for him to apply large quantities of phosphates to his fields, as is often the case, he would probably get that material more cheaply by purchasing a superphosphate or bone meal, than by getting horse manure from city stables. This would be true, especially if the phosphate and horse manure were valued according to their composition, for, in the case of the latter, the farmer would have to purchase a larger percentage of nitrogen and potash than he desired. It is, undoubtedly, a fact, that if any special ingredient is lacking in a soil, that want can be most cheaply met by purchasing some commercial fertilizer that contains chiefly the substance needed, provided the manure must in either case be bought.

2. The excrements of animals contain a large percentage of organic material that commercial fertilizers do not. This is undoubtedly a point in favor of stable manure, though the carbonaceous compounds of the latter are not needed to supply any deficiencies of plant food. They can furnish only water and carbonic acid, both of which the soil and air can supply in abundance. The chief benefits arising from applying organic material to

any soil results from a change in its physical condition, and from the effecting of a more abundant use of its natural fertility. The addition of decaying vegetable material to the soil often brings about a favorable change in texture and color, while the liberation of so much carbonic acid as comes from the decomposing manure accelerates the disintegration of the soil itself. We have seen how the valuable plant food which is latent in a soil may be made useful through disintegration. These two distinct effects are not to be disregarded when we compare the manures made on the farm with those found in the market, and they constitute a strong argument in favor of the former.

3. It costs more to handle the same amount of plant food in stable manure than in commercial fertilizers. This is obvious when we consider the bulky nature of the former.

Although there are instances of the successful maintenance of the fertility of the soil by the application of commercial fertilizers alone, the basis of good farming in Pennsylvania, consists in the manufacture of manure from the food of cattle. The most profitable use that Pennsylvania farmers can make of the fertilizers of the markets, is as an amendment to those produced on the farm; as such, they may often be made a paying investment. It is no argument against their use, that the purchasers do not always get their money back. The same would undoubtedly hold true of the purchasing of stable manure in an equal number of cases.

Let us now return to a consideration of what fertilizers to buy and how to use them. The first principle to be laid down is, that a farmer can only buy fertilizers with profit, when he purchases what he needs. What is meant can be illustrated by citing two cases reported by Professor W. O. Atwater:

Chester Sage, Esq., of Middletown, Conn., raised corn at the rate of sixty-two bushels per acre, by the application of potash manures costing four and one half dollars, a gain of fifty-one bushels over the corn that had no manure. Superphosphate produced no increase of crop in this case. W. J. Bartholomew, of the same State, found potash useless on his land, while superphosphate caused an increased production of thirteen bushels of corn per acre. Would any sane person advise both of these farmers to manure their farms alike? We think not. It is not to be expected, that soils differing in origin and treatment, will each call for the same fertilizer. Practice proves that such is not the case.

Neither are we safe in assuming that the various farm crops should all receive the same kind of manuring. It is not wise to furnish a plant with what it can get for itself. No shrewd farmer would ever think of applying nitrogenous fertilizers to clover, for clover can get its own nitrogen. Plants have different capacities for gathering the various substances they need for food, and we need to recognize this fact.

But some one asks, How am I to discover what my soil and the various crops I grow most need? The answer is: Make a study of your soil and crops; you know about the different fertilizers in the markets, or ought to; you know when you are buying largely of nitrogen, phosphoric acid, or potash, or a mixture of these, at least you should know. Now apply them separately and mixed, and if you are a close observer, you will not fail to discover which application insures you the greatest profit, or if there is any profit in the use of any kind. The chances are, that you will find that one kind has a much better effect on your corn or wheat than another. Do not watch your neighbor, and judge from his results, what you had better do; try for yourself. We have already learned some facts that may serve as hints, nothing more. All other things being equal, save the difference in the crops growing, good results are most likely to follow from the use of nitrogenous fertilizers on grain or grass, potash on potatoes and roots, while phosphates seem in general, to come in well with all crops. Generally, a mixture of the three valuable ingredients, with one or two greatly preponderating, is best. Professor Atwater's efforts have pretty clearly brought out the fact that it does not pay to use much nitrogen in growing corn, but that phosphoric acid and potash, one or both, with a small quantity of nitrogen are generally most profitable.

In the case of sugar beets, manured solely with commercial fertilizers, a mixture of the three valuable ingredients is wisest when the interests of both the farmer and sugar manufacturer are considered. The application of phosphoric acid tends to increase the percentage of sugar in the beets, but if superphosphate alone be used, they stop growing and ripen too early. To counteract this tendency to early ripening and to keep them growing until they are large, nitrogenous manures should also be used. The large quantity of potash, which beets extract from the soil, would cause the soil to become "beet sick," (as the Germans say,) after a while, if no potash was in the manure. As before stated, no nitrogen compounds need be applied to clover, and this doubtless holds true for all leguminous plants, such as peas and beans.

Is it well for farmers to buy commercial fertilizers? The profits of so doing will depend largely upon three conditions:

1. Some reliable guarantee of the quality of the fertilizer bought, should be furnished.
2. Farmers should be sufficiently informed about commercial manures to understand how to buy the ingredients they desire.
3. Farmers should be sufficiently acquainted with the needs of their farm to know what ingredients the soil needs in order to give a profitable increase of any particular crop."

Many manuring formulas have been concocted, such as the "Stockbridge Manures," "Mapes Complete Manures," &c.

The principle underlying these formulas is scientifically and practically wrong. The assumption that an universal system of manuring can be made most profitable, is of the barest kind, and is not supported by facts of any sort. Why apply seventy-two pounds of nitrogen to an acre of corn, as Prof. Stockbridge's formula demands, when in no case, out of over ninety trials, has such a proceeding failed to result in loss. The Stockbridge manures were at first compounded according to the theory that we must apply to the soil all the nitrogen, phosphoric acid, and potash, that the expected increase of crops would contain. What a theory by which to manure clover, a plant that contains a large percentage of nitrogen, but does not trouble the farmer to furnish any of it!

The Production of Farm Manures.

No one will dispute the statement that it is an essential thing for each farmer to see that his manure heap attains the maximum in quantity and quality. There should be as much as possible, as good as possible. Farm manures still constitute the basis of successful farming in Pennsylvania.

The relation of Manure to the Food producing it.—Primarily the value of a manure heap depends upon the food from which it is produced. It is not enough to say that the more food the more manure. The differences in the manure made from two kinds of cattle food are as broad as the differences in the foods themselves. This is a fact that farmers have generally failed to appreciate. Let us consider the matter more in detail.

We have seen that any substance called manure has a value that corresponds to its content of nitrogen, phosphoric acid, and potash, so that it is easy to understand that the manurial value of any cattle food must depend upon what that food is able to contribute to the manure heap of one, two, or all of the above named valuable ingredients. Now the materials in common use as food for cattle vary greatly in the amounts of nitrogen, phosphoric acid, and potash they contain, as can be seen from the following table: *

KIND OF CATTLE FOOD.	Quantities of valuable ingredients in one ton of each cattle food.		
	Nitrogen. *Pounds.*	Phosphoric acid. *Pounds.*	Potash. *Pounds.*
English hay,	31	8.2	26.4
Clover hay,	39.4	11.2	37.2
Young grass,	11.2	4.4	23.2
Green fodder corn,	3.8	2.0	7.4
Potatoes,	6.8	3.2	11.6
Fodder beets,	3.6	1.6	9.6
Sugar beets,	3.2	1.8	7.8
Turnips,	3.6	1.6	5.8
Sugar beet pulp,	5.8	2.2	7.8
Wheat straw,	9.6	4.4	12.6
Rye straw,	8	5.0	17.2
Barley straw,	12.8	3.8	21.4
Oat straw,	11.2	5.6	32.6
Corn,	32	11.4	7.4
Barley,	32	15.6	9.4
Oats,	38.4	13.6	9.6
Buckwheat,	28.8	11.4	5.4
Peas,	71.6	17.2	19.6
Beans,	81.6	23.8	26.2
Wheat bran,	44.8	54.6	28.6
Cotton-seed cake,	*78	56.2	29.2
Linseed cake,	90.6	32.2	24.8

*This seems to be a smaller quantity than is being found by American analysis.

If all the ingredients contained in the various cattle food were to find their way into the solid and liquid excrements of the animals fed, we could use the above figures for calculating the manurial value obtained by feeding the materials mentioned. But there is a loss incurred by feeding. A certain amount of the nitrogen, phosphoric acid, and potash contained in the food consumed, goes in other directions than into the manure heap, and the quantities thus turned into other channels depend upon the kind and use of the animal fed. A large amount of scientific work has been done in order to determine how much of the nitrogen, &c., of any kind of food is found in the manure it produces, and thanks to such investigation, we can make statements that approximate very closely to the truth.

The average percentage of the nitrogen of the food that goes into the solid and liquid excrements of the cow, ox, sheep, and horse, is, approximately, 83 per cent., the lowest being that for the cow, 64 per cent., and the highest that for the sheep, 95.5 per cent. Of the mineral substances, phosphoric acid and potash, nearly all is found in the manure, with no animal falling below 97 per cent. of that in food. The following table* shows for itself:

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*Taken from Wolff's Praktische Dungerlehre.

		Percentages of the valuable manurial ingredients of the cattle foods that pass into the manure they produce, determined for the common farm animals.				
		Cow.	Ox.	Sheep.	Horse.	Average.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Nitrogen, ...	In solids, ...	45.5	51	43.7	58.1	49.1
	In urine, ...	18.3	38.6	51.8	27.3	34
	Total, ...	63.8	89.6	95.5	83.4	83.1
Mineral substances,	In solids, ...	53.9	70.8	63.2	85.6	68.4
	In urine, ...	43.1	46.7	40.3	16.3	35.1
	Total, ...	97	117.5	103.5	101.9	†103.5

It is seen that different species of farm animals do not make equally valuable manure from the same kind of food. Other things being equal, a growing animal makes poorer manure than one full grown, because of the demands made upon the food for the formation of bone and muscle. With the same feed a cow giving milk makes less valuable manure than one that does not, for the milk takes up quite an amount of nitrogen and mineral substances. The cattle withdrawing the least manurial value from the food they eat are fattening animals, and those standing still and makin no growth or producing nothing.

We are quite safe in assuming that on the average 80 per cent. of the nitrogen and 95 per cent. of the phosphoric acid and potash that are fed to farm animals pass into the solid and liquid excrements. Taking these figures as a basis, and knowing the composition of any cattle food, we can easily calculate the relative money value of the manure it is capable of producing, provided one can settle upon a fair price per pound for the valuable ingredients. Now we have a list of prices from which commercial manures are valued, that is, it costs so much to obtain a pound of nitrogen according to the form in which it exists, and the same for phosphoric acid and potash. The nitrogen of fish can be bought for twenty cents per pound, and probably has about the same value as that of stable manure. The real value of the nitrogen in manure depends somewhat upon the digestibility of the food from which it came. All the nitrogen that is contained in the digested nitrogenous compounds and not used by the animal passes out i the urine, while the undigested nitrogen passes into the solid excrement The nitrogenous compounds of the urine are much more easily decomposed and made over into plant food than those of the solid excrements, therefore are more valuable. While not over 50 per cent. of the nitrogenous substances contained in straw would be digested, as much as 85 per cent. of the same compounds in corn meal would pass through the process of digestion. A larger percentage of the nitrogen of the latter would therefore be found in the urine, consequently ten pounds of that element as existing in manure produced by corn would be more valuable than the same quantity in manure made from straw. In general, it can be said that the valu con- stituents of the excrements from concentrated cattle foods have gher e d gener-

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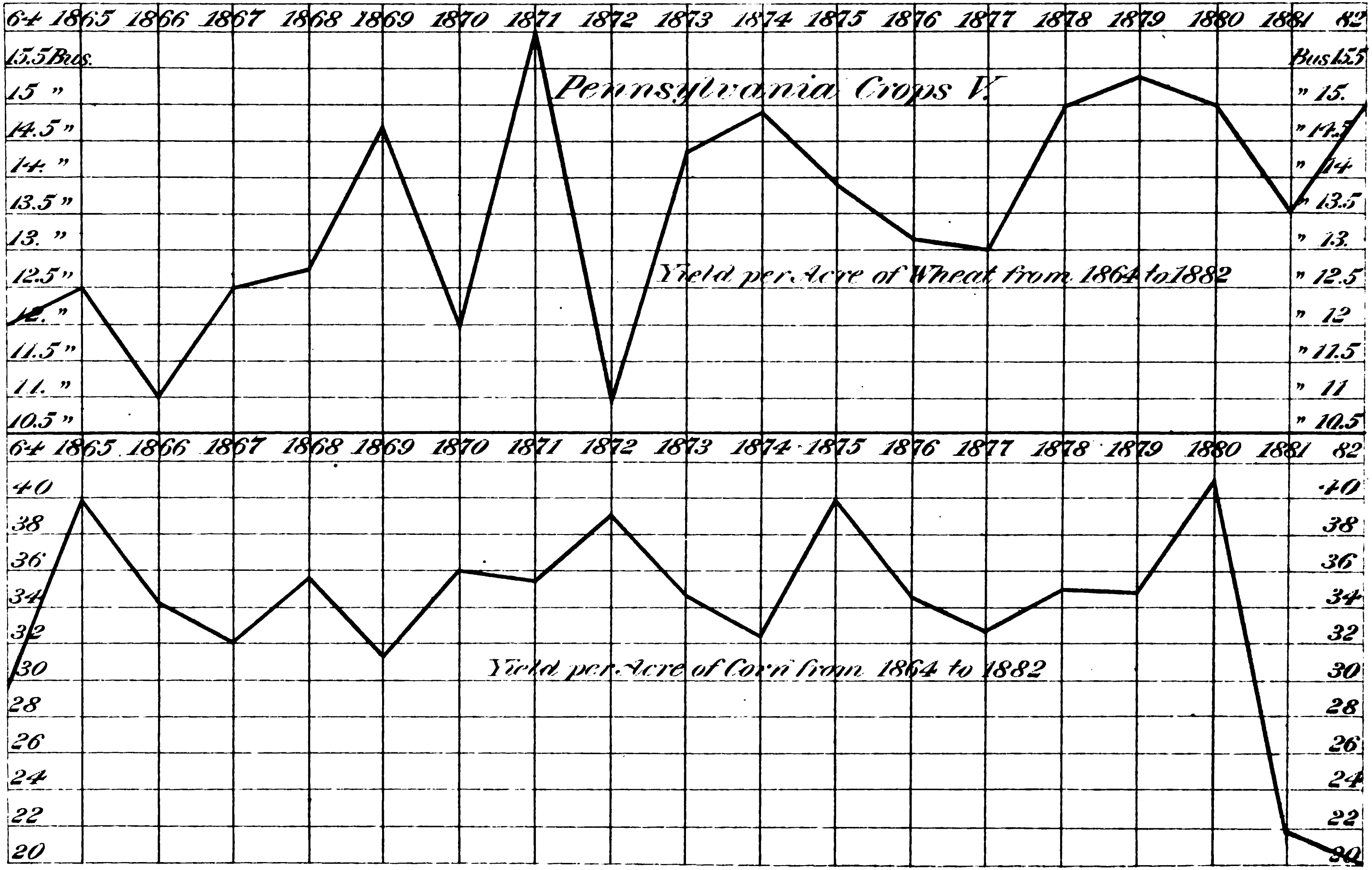
*Taken from Wolff's Praktische Dungerlehre.

† More than 100 per cent. because of the mineral substances in the wate that accidentally get into the food.



Pennsylvania Crops V.

Yield per Acre of Wheat from 1864 to 1882

Yield per Acre of Corn from 1864 to 1882

For yield of corn crop, 1882, Plate V, for 20, read 29.

ways these differences cannot easily be taken into account. We will take the above-mentioned price of the nitrogen of fish as a basis for calculation. Soluble phosphoric acid is worth twelve and a half cents per pound. Only a portion of that even in well-rotted manure is soluble, so that nine cents may be assumed as a fair price for the phosphoric acid of stable manure. The alkalies are to quite an extent soluble, as they go out largely in the urine, and can probably be considered as worth four cents in the total excrement.

The money values given in the following table are calculated on the basis given above, viz: 80 per cent. of the nitrogen, and 95 per cent. of the phosphoric acid and potash of the food are considered as passing into the manure, these three ingredients being estimated as worth twenty, nine, and four cents per pound, respectively. From the values thus obtained 20 per cent. is deducted on account of greater bulk and larger dilution of farm compared with commercial manures. The greater bulk causes more expense in handling, and the dilution causes slower action, the returns from invested capital not being so immediate as is the case with concentrated fertilizers.

KIND OF CATTLE FOOD.	Money value of manure from 1 ton.	Kind of Cattle Food.	Money value of manure from 1 ton.
English hay, ...	$5 86	Barley straw, . . .	$2 71
Clover hay, ...	7 60	Oat straw, ...	2 46
Young grass, . . .	2 67	Corn, ...	5 55
Green fodder corn, . .	1 04	Barley, ...	5 95
Potatoes, ...	1 58	Oats, ...	6 63
Fodder beets, ...	0 87	Buckwheat, . . .	5 10
Sugar beets, ...	0 84	Peas, ...	12 00
Turnips, ...	0 87	Beans, ...	14 15
Sugar beet pulp, . .	1 26	Wheat barn, . . .	11 37
Wheat straw, ...	2 61	Cotton-seed cake, .	16 18
Rye straw, ...	2 77	Linseed cake, . . .	16 00

If a farmer can afford to buy commercial fertilizers he can safely make use of the above estimates in calculating the manure value of purchased cattle foods, even if the food stuffs are fed to milch cows or growing animals. When fed to fattening animals still higher values could rightfully be used. The table plainly indicates that when any material is bought to feed to cattle the purchaser desires profit from two sources. He gets an increased production of meat or milk. and also is able to raise larger crops because of the great amount of fertilizing material he is enabled to apply to his land. Is it not a fact that the cheapest way to buy fertilizers is to purchase them in the form of wheat bran, corn meal, or cotton-seed meal?

The weight of fresh manure that would be produced by a ton of any food stuff can be approximately determined. About 50 per cent. of the solids of the food passes into the solid and liquid excrements. The mixed excrements contain about three fourths water. Taking one half of the solid matter in a ton of hay, which would be half of about 1,760 pounds, and multiplying that weight by four, we should have 3,520 pounds as the weight of manure from one ton of hay. To this must be added the litter, bringing the quantity up to about two tons. A cow wintered upon two tons and a half of hay would therefore produce not far from five tons of manure, provided she be well littered and none of the excrements be wasted.

If the hay be first class, according to the estimates of the previous table, the above five tons of manure, made from two and a half tons of hay, would be worth about $14 65, no account being made of the value of the litter. What, over $14 00 worth of manure from one cow in one winter, when she eats nothing but good hay? Yes, at the present prices paid for fertillizers it would cost that sum to replace the nitrogen, phosphoric acid, and potash in that manure if it were sold from the farm.

It might possibly be of some interest to estimate the money value of a cord of stable manure, basing the calculations upon its chemical composition. Such manure varies so, however, in the amount of water it contains, and because of the food that may have produced it, that the value placed upon any given sample would apply only to manure produced under like conditions of food and treatment. The excrements of A's animals, that eat nothing but hay and straw, are much inferior to those from B's cattle that consume large quantities of corn meal, bran, and cotton seed. When one purchases stable manure, it is well to know what the animals that produce it have eaten. Partially rotted stable manure is worth more than fresh, because as it decomposes it tends to be more concentrated.

The Preservation of Farm Manures.

It is not enough to convert food into manure. The latter must be economically preserved, in order that the best results may be obtained. The estimates made in the previous tables only hold where all of the solid and liquid excrements are saved. Successful farming demands that this be done. But is it generally done in Pennsylvania? Probably not.

How many manure heaps there are that lie exposed in a barn-yard, from which a stream of black water flows after every rain. Do you know, farmer, that the compounds of nitrogen, phosphoric acid, and potash that gives your manure heap the larger part of its value are, to quite an extent, soluble in water, and that they can easily be leached out, thereby causing you, indirectly, a loss of dollars and cents?

What more conclusive proof of the above statements do you want than the sight of the luxuriant grass growing in the track of the leachings from the barn-yard. If such leachings could all be taken up by your mowing fields it would be another matter; but very often this is not the case. Dr. Völcker, of England, carried on an investigation that led to a satisfactory demonstration of the effect of exposure and leaching upon a heap of yard manure. He exposed manure under four different conditions, and by weighing and analyses at stated periods was able to take account of the changes and loss that were taking place. The manure was submitted to the various conditions for nearly a year, which were as follows:

No. 1. Fresh manure exposed in a heap against a wall.
No. 2. Fresh manure kept under a shed.
No. 3. Fresh manure spread in open yard.
No. 4. Well-rotted manure exposed in a heap against a wall.

When the manure was first placed under the above-named conditions, it was weighed and analyzed, and during the year's time that it remained where it was placed, was weighed and analyzed four more times, in order to discover the changes that were going on. In the following tables are given the dates at which the weighings and analyses were made, the composition, and the percentage of loss by weight:

The manure was first exposed to the various conditions November 3, 1854.

No. 1. Fresh manure exposed in a heap against a wall:

	Nov. 3, 1854.	Feb. 14, 1855.	Apr. 30, 1855.	Aug. 23, 1855.	Nov. 15, 1855.
Water,	66.17	69.83	65.95	75.49	74.29
Soluble organic substance,	2.48	3.86	4.27	2 95	2.74
Soluble inorganic substance,	1.54	2.97	2.86	1.97	1.87
Containing nitrogen,	.149	.27	.30	.19	.18
Per cent. of loss in weight,	. . .	. . . .	28.6	29.7	30.4

No. 2. Fresh manure kept under a shed:

	Nov. 3, 1854.	Feb. 14, 1855.	Apr. 30, 1855.	Aug. 23, 1855.	Nov. 15, 1855.
Water,	66.17	67.32	56.89	43.43	41.66
Soluble organic substance,	2.48	2.63	4.63	4.13	5.37
Soluble inorganic substance,	1.54	2.12	3.38	3.05	4.43
Containing nitrogen,	.149	.17	.27	.26	.42
Per cent. of loss in weight,	. . . .	. . . . .	50.4	60.0	62.1

No. 3. Fresh manure spread in open yard:

	Nov. 3, 1854.	Feb. 14, 1855.	Apr. 30, 1855.	Aug. 23, 1855.	Nov. 15, 1855.
Water,	66.17	. . . . .	80.02	70.09	65.56
Soluble organic substance,	2.48	. . . . .	1.16	.49	.42
Soluble inorganic substance,	1.54	. . . . .	1.01	.64	.57
Containing nitrogen,	.149	. . . . .	.08	.06	.03
Per cent. of loss in weight,	. . . . .	. . . . .	13.04	38.07	42.4

No. 4. Rotton manure exposed in a heap against a wall:

	Dec. 5, 1854.	Feb. 14, 1855.	Apr. 30, 1855.	Aug. 23, 1855.	Nov. 15, 1855.
Water,	75.42	73.90	68.93	72.25	71.55
Soluble organic substance,	3.71	2.70	2.21	1.50	1.13
Soluble inorganic substance,	1.47	2.06	1.68	1.10	1.04
Containing nitrogen,	.297	.149	.14	.09	.09
Per cent. of loss in weight,	. . . . .	. . . . .	26.50	36.5	37.8

These tables need studying in order to get at the facts they teach. The tendency of farm manure in fermenting is to lose weight, and to increase its percentage of soluble material. If no leaching takes place this soluble material will accumulate in the heap, that is, the heap will become more concentrated in soluble matter. This is seen to be the case in the pile of manure kept under a shed. Of the fresh manure kept out of doors that in the heap suffered least. The heap that was rotted in the start suffered more than the fresh. It is to be noticed that the manure kept under a shed lost considerable in weight, but the loss was largely in water which dried out, and in carbonic acid which resulted from the combustion going on in the heap. A little calculation shows that there was more soluble nitrogen in the covered pile at the end of the year than at the beginning, while in all the other samples of manure there was considerable loss, not only of nitrogen but of other valuable material. The following table may be interesting in showing the relative actual loss of organic material and nitrogen by keeping manure under various conditions, also in giving a hint as to whether there is a loss in fermenting manure under favorable conditions. If any valuable ingredient were to be lost from manure decomposing under a shed, it would be nitrogen.

		Total quantities of organic matter and nitrogen in manure at beginning of experiment, November 3, 1854.	Total quantities of organic matter and nitrogen in manure at end of experiment, November 15, 1855.	Percentage of loss of organic matter and nitrogen by the various methods of keeping the manure.
		Pounds.	*Pounds.*	*Per cent.*
No. 1.	Organic matter, .	801	268	66.6
	Nitrogen, .	18.2	13	28.5
No. 2.	Organic matter, .	919	408	55.5
	Nitrogen,	20	18.8	6
No. 3.	Organic matter, .	466	98	78.6
	Nitrogen,	9.5	3.9	59
No. 4.	Organic matter, .	266	135	49.2
	Nitrogen, ...	9.8	6.6	32.7

Are not these figures sufficiently striking to induce a careless farmer to exercise some care in preventing loss from his manure heaps? Only six per cent. of nitrogen was lost when the manure was covered, and fifty-nine per cent. when it was spread out and allowed to leach. Even when in a heap out of doors thirty per cent. nearly of the nitrogen was lost. There is no reason to doubt but that a corresponding loss occurred with the valuable mineral ingredients, from the careless management.

Again, there is often a careless waste of the urine.

Now, the liquid excrements are valuable. We have seen that all the nitrogen compounds which pass through the processes of digestion and are not used by the animal, pass out in the urine. The potash goes out in the same channel, while the phosphoric acid is retained with the solid excrement. The manurial ingredients of the liquid excrement are more valuable, pound for pound, than those of the same kind existing in the solid. Then why not save them?

Until farmers avoid the wastes incurred in the two ways mentioned above, let them not complain of hard times or the barrenness of their fields. What foolishness, also, to buy commercial fertilizers and pay for what might be obtained much more cheaply by the exercise of a little care!

What is the best method of preserving manure? Use plenty of absorbents, unless you have water-tight tanks in the barn cellar. Dry loam and muck, when they can be used, are better for absorbents than straw, for the reason that strawy manure cannot easily be distributed in the soil in an even and finely divided condition. Have a good barn cellar, with water-tight tanks, if possible; if not, then build a manure shed. In the latter case, or if the manure *must* be thrown into an open yard, have the floor beneath the cattle water-tight, so that all the liquid can be taken up by the absorbent used.

Some suggestions with reference to the differences of treatment demanded by the manure from the different farm animals, may not be amiss. It is well known to farmers that horse and sheep manure, under certain conditions, are very liable to ferment so rapidly as to get hot. When this occurs the manure grows white, and seems to have been burned. The question is often asked, does it cause any loss to have such a thing happen? We answer, yes. Almost the entire amount of nitrogen in a heap of manure may thus be driven out largely in the form of ammonia. The reason why horse manure "heats" so much more readily than that from cows, is, that it is coarser and not so wet. This coarseness allows a free circulation of air through the heap, while the dryness admits of a more rapid rise of temperature than would be possible if it contained more moisture. A larger amount of water would also increase the capacity of the manure to absorb and retain the products of decomposition. The more compact and moist a pile of horse manure can be kept, the less danger there is of loss from heating. It is an admirable plan to throw the excrements of horses and cows together, where they can become thoroughly mixed, the mutual effect of the two kinds upon one another causing a saving in the case of the one and an increased activity of the other. The manure of sheep had better be trodden under their feet, to lie in a compact condition until about the time it is used.

The Treatment and Application of Farm Manures to the Soil.

The questions most commonly asked in regard to how to treat and use farm manures, are:

(1) Is it better to ferment manure or apply it green? and

(2) When it is applied, is top dressing, or working manure into the soil, the better method?

In answering the first inquiry, let us first consider the differences between rotted manure and "green" manure.

When the excrements first come from the animal, the manurial ingredients, especially in the undigested portions or solids, exist in the same form that they did in the plant. Now, one plant, unless parasitic, cannot feed upon the material that exists in another until such material has undergone certain changes. In order that the ingredients contained in vegetable fabric may become plant food, a decomposition must take place. The phosphoric acid needs to be liberated from its organic combinations, and the nitrogenous substances in the vegetable material must be broken down so that the nitrogen can be converted into ammonia and nitric acid. When manure is rotted there occurs a partial, and, to some extent, a complete breaking down of the vegetable compounds in the excrements, and an additional decomposition of the substances in the urine, which are chiefly the result of a previous partial breaking down of the albuminoids in the animal.

While but little ammonia and nitric acid may be formed in fermented manure, the decomposition that has taken place has carried the valuable ingredients of the fresh excrements quite a long distance in the direction of the forms into which they must finally come in order to serve the purposes of the plant. Consequently, rotted manure can more quickly produce a vigorous effect upon growing crops than that which is fresh. Farmers recognize this fact when they put well rotted manure under a row of celery instead of green.

But the question of the availibility of the plant food in stable manure at the time it enters the soil is not the only one that must be considered.

It is essential for us to know whether in fermenting manure, or in making its nitrogen, phosphoric acid, and potash more available to plants, there is not a loss of these substances. Again, is there reason for believing that any beneficial effects result from having the manure go through its chemical changes while in contact with the soil rather than before it is applied to the land?

As to the matter of loss from fermenting manure, we will again refer to the table showing the results of Dr. Vòlcker's investigations where he found that only six per cent. of nitrogen was lost from the manure fermented under a shed. It is safe to assume that there would not be an appreciable loss of the mineral ingredients of animal excrements during the process of decomposition provided no leaching takes place.

Manure fermented under proper conditions doubtless does not suffer a very large loss. And by proper conditions is, the keeping of the heap moist after the excrements have received a mixture of absorbents. If manure be allowed to rot, great care should be taken to secure a complete absorption of the products of decomposition, and to this end it should not be too rapid and should be accompanied by moisture. With manure largely from concentrated food, there is no doubt but that the use of absorbents tends especially to insure against loss from the chemical changes that take place. Granting that rotted manure is more efficient at first, and can be obtained without much loss, it is to be said on the other hand that the excrements of animals cannot be put through a thorough process of decomposition without involving an extra expense, and this is especially true of manure treated so as to ferment without loss. The factor of expense must be allowed.

The other question to be considered is that of the benefit coming from having the manure go through the chemical changes necessary to convert it into plant food, when in contact with the soil. Although it is to a certain extent still a matter of theory, yet we have no doubt but that the decomposition of stable manure after it is mixed with the soil causes an increased disintegration of the latter.

Previous figures show the large amounts of inert plant food that may exist in even run-out fields. When we have brought this into a condition for plants to use we have added so much more to the capital applied to our farming operations. Our soils are still a store-house of plant tood, and there is every reason to believe that the decay of the organic material of animal excrements after its application to the land is an efficient agent in forcing into service the inactive mineral substances.

Now, in all that has been written no answer has been given to the question: Is it best to decompose manure out of the soil, or in it? The special circumstances of a market gardener would seem to indicate that he can best use rotted manure, while it might be equally wise for a farmer on a light, loose soil to apply it in a fresh state. At the same time no exact experimental work has been done to determine the relative profits from the use of stable manures in the two conditions. It is a somewhat complicated question, and one that demands further investigation.

The practice of top dressing as compared with working manure into the soil, is one of importance. And here we cannot appeal to definite results to establish the correctness of either method of practice. There is not the slightest doubt but that so far as theoretical arguments are concerned, they are strongly against top dressing. This is especially true if horse manure be the one used. By putting fresh manure on the surface of the land we lose the good effect that would result from its decomposition in the soil, we stand in danger of a certain amount of loss of manurial value, and when the manure is in a coarse, lumpy condition, as it is likely to be when not rotted, we get a poor distribution and slow returns. Do not say that it costs something to mix with the soil. Cultivation pays for itself in the greater utilization of the natural fertility of your fields.

Nevertheless, in spite of the weight of evidence furnished by theory, we are not prepared to assert that top dressing is always less profitable than some other method of applying manure. We are waiting for accurate facts.

It is not claimed that this paper approaches anything like completeness as a presentation of the facts bearing upon the manuring of land. It does contain facts enough, when heeded, to greatly improve the condition and profits of Pennsylvania agriculture.

The address of Prof. Jordan being open for discussion—

Mr. **FORSEMAN.** I think that this question of the "Exhaustion of the Soil" is of a great deal of importance to the farmers of Pennsylvania. I am not the oldest farmer here, but I am an old Pennsylvania farmer. If it was not for the winding up of the professor's speech, it would be very discouraging to us who are keeping up our lands with lime and clover. He intimates that lime is not a fertilizer, that clover is not a fertilizer, that they do not increase the fertility of the soil; but he winds up by saying, that if you put back on the land all you have taken off, you can keep it in a good condition. It has been the universal practice of the people in the eastern part of the State, and I learned it from my father, that when a field becomes exhausted so that clover cannot grow, the next thing that can grow is sorrel. We plow down the sorrel, put in oats, then wheat, then lime, and have an abundant crop of clover. What is the fertilizer? Is it the tilling of the soil, is it the grass crops or the clover? We can turn that clover down and raise a good crop of corn next year. Another thing he did not explain to my satisfaction. That is, he gives the name of the different ingredients in the soil to produce the crops, and says, if one is exhausted the whole crop fails. Now, how does he get the ingredient back? I would like to ask the question, whether that ingredient is in the barnyard manure, so that when you put it back on the soil it will supply the other particular ingredients? How does he know that these particular ingredients are in the manure? How are farmers to know what particular ingredients are in the soil? I think he is correct in regard to fertilizers. I don't believe that there is one farm under the sun that can be kept up without fertilizers. If you can raise corn and oats, wheat and clover, you must have the material to feed on; and if that material is taken out of the ground, it must be returned. I know that I have been farming for twenty-five years, and never used commercial fertilizers but once, and then saw no result whatever. I kept my farm up with lime and manure, and it is in better condition now than it ever was; and it is the same with land in the eastern part of the State. It is said that Lancaster county to-day is producing better crops than she ever did. Another question—in regard to the western prairies. To illustrate: They say that the Red River valley soil is twelve feet deep; they say that it will produce forever. Will these ingredients that produce wheat become exhausted, so that it will become entirely worthless? I don't want the professor to discourage us old farmers, who try to keep our lands in a high state of cultivation. We have been successful, and I think I agree with him when he comes down to the exact point. One thing I don't exactly agree with; I don't believe that wheat-bran makes as good manure as corn.

Prof. **JORDAN.** This gentleman says his land gets exhausted; gets sorrel on it, rests awhile, then he puts on lime, and finally gets clover again. I tried to make it plain that soil exhaustion does not mean the removal of any one thing from the soil; it means the removal of plant food so far as it existed there in an available form. Now there is a constant decomposition going on. You put on the lime and it hastens that decomposition. The clover had ceased to grow, and sorrel came in, because the clover was starved out. As soon as the land had a rest of a year, and was then limed, plant food accumulated in an available form, and he got his crop. This is the only possible explanation. How known as to the ingredient that is lacking? If you wish to supply this by the use of commercial fertilizers, the kind to use can only be determined by experiment. Yard manure is the result of the decomposition of the plant by animal digestion, and it contains everything that the plant contains, and when this is applied you are sure to meet the demands of your crops. I believe the rational plan of maintaining the fertility of the soil is by the use of yard manure; and if you live in a locality where the land naturally lacks potash, phosphoric acid as a fertilizer will not supply the want. Now, in regard to this question of soil—will it ever get exhausted? It will. Take that western soil and grow crops for many years, and it will become exhausted. That is just as true as that one and one make two, or two and two make four.

Mr. BEEBE. Are we to deduce from your remarks that clover affords no manure? Does the plowing down of any green crop add anything to the soil?

Prof. JORDAN. The plowing down of any green crop adds one thing to the soil; it adds carbonaceous material. That, however, is furnished during the growth of the plant from the atmosphere. Plowing down does not add anything of manurial value to the soil that was not taken from the soil.

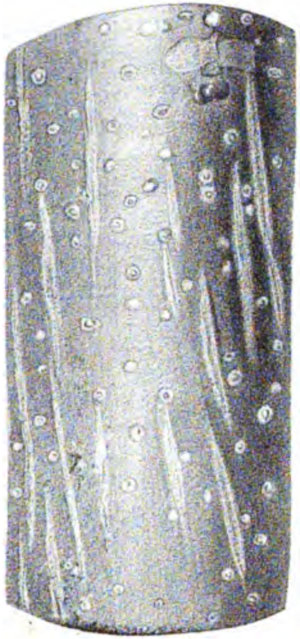
Mr. BEEBE. Plowing down clover adds one thing; would plowing down corn add anything?

Prof. JORDAN. Yes; carbonaceous material.

Mr. BEEBE. One thing more. Take a field of red clover that has been sown six years; clover disappears. Give that field a coating of plaster—good plaster, say eighty to ninety per cent. pure gypsum—it will bring probably a full crop of red clover. How is that?

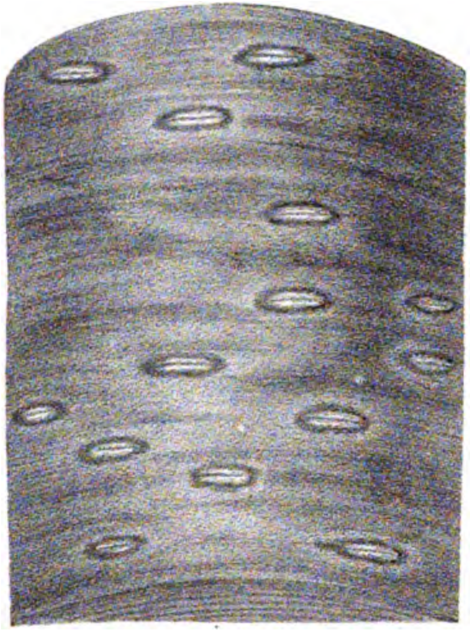
Prof. JORDAN. I find no other explanation for it than that the plaster has had the same effect as tillage or lime, viz: That it brings into use diferent materials already in the soil. I have seen sorrel on fields that were high and gravelly and on soils that are very heavy with organic matter. I believe that the theory that the soil contains acid which the lime neutralizes rests on no foundation whatever. Acid does not appear in such soils. We take low, wet, mucky soils full of organic matter, they are what we call sour; but that does not exist in that kind of land in which sorrel appears in abundance; therefore, I don't see that it is a sufficient explanation that the lime neutralizes the acid.

2–c.



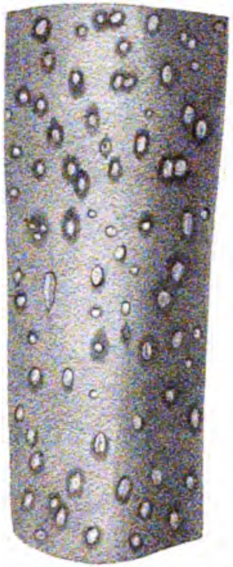
2-c.—The third year of the Paulownia imperialis, the larger masses having spread upwards and downwards, the smaller ones of last year, preparing for the same development next year.

3–b.



3-b.—The common Cherry at four years showing the progress of the cells in destroying bark in a lateral direction.

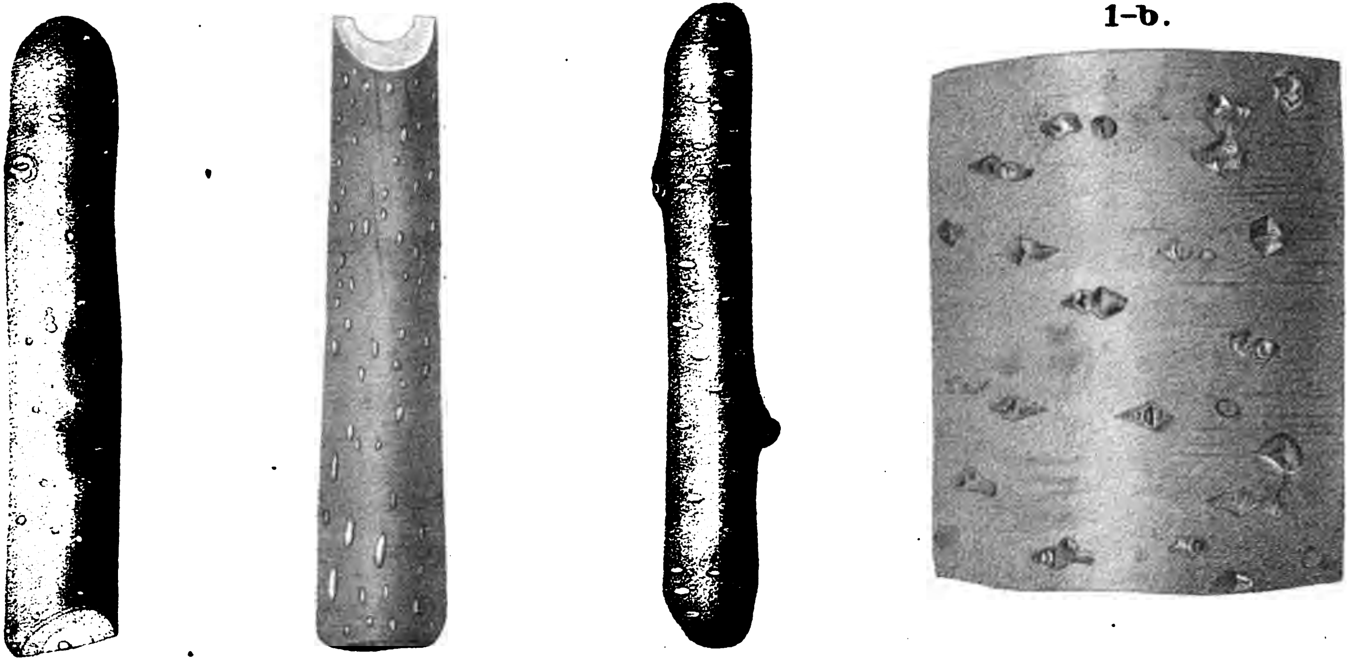
2–b.



2-b.—The Paulownia imperialis two years old, the larger masses developing.

Illustrations of the development of Suber-cells on the bark of trees, by the agency of which the fissures known as "rough-bark" are formed.

1–a. 2–a. 3–a. 1–b.



1–a.—A two year old branch of Populus alba, or Silver Poplar.

2–a.—One year branch of Paulownia imperialis, showing the masses of Suber-cells, as they are formed the first year.

3–a.—Two year branch of the common Cherry, illustrative of the lateral direction of Suber-cell development.

1–b.—A four year old branch of Populus alba, or Silver Poplar.

Illustrations of the development of Suber-cells on the bark of trees, by the agency of which the fissures known as "rough-bark" are formed.

THE BARK OF TREES AND ITS FUNCTIONS.

By THOMAS MEEHAN, *Botanist of the Board.*

MR. PRESIDENT, MEMBERS OF THE BOARD, AND VISITING FRIENDS: I have noticed in the addresses which I have had the honor to make to the Board on several occasions, that friends desired to ask questions on the suggestions which I had thrown out during my remarks. I am anxious to encourage this practice, and I do not propose to talk long this evening, in order to have questions asked, and have them answered.

When I was asked by the Secretary to name the subject on which to address you this evening, I was at a loss to know what would be the most interesting. I was interested at the time in a discussion between the editors of two agricultural papers. It was on "How to Grow Peach Trees to make them most Productive, and to Bear the Finest Specimens that could be Grown." And one editor replied, "if you would have good peaches, the simplest plan is the best you can adopt. After they commence to grow, whitewash the stems of the trees with lime-wash, or with lye occasionally, and pour boiling hot water around the roots of the trees, thereby destroying the fungi and insects, thus helping the growth of the trees." This was given by a highly recommended agricultural paper. Another editor objected to that view, and spoke of spoiling the growth by the use of such washes, and that throwing boiling hot water around the roots of trees destroyed the tissues at the roots. Whoever heard of such a thing. Both gentlemen were evidently speaking from a practical stand-point, with widely different views. But we have known this to be the case before.

One asked "What should he do for hide-bound trees; they bore no fruit, and did not grow, and what should he do as a remedy?" "Why," said the editor, "slit the bark open, from top to bottom." Then another editor takes the reply up, and denounces it as absurdity. "Whoever heard the like; a man attacked with rheumatism might as well slit up his leg." It seemed strange that two intelligent men should have such different views of things.

And I have wondered how it is, that some have such a lack of knowledge what bark is for, and how it was made. In looking at standard botanical works, I have been surprised even at the views of scientific men, as to the practical nature of bark, or what purpose it serves in the economy of plant life; and it seemed that the Board would, perhaps, care to hear a few remarks on the subject of bark, how it is formed, how it grows, and how it dies. I thought this might be of some practical use in teaching what would be good, under some circumstances, in the practical treatment of trees.

The first view of the question would be, what is bark for? If I were talking to children, and telling them what bark was for, I would say just for the same reason that you have a bag to put your marbles in; it is merely to hold the contents together. Simply like a marble bag to hold the marbles together. A tree is not an individual; but the assembling of a number of individuals. The tree is rather a republic, or city, in which a large number of individuals are gathered together for mutual defense. They know that in unity there is strength, and they have only united in order to more effectually carry on their vested power. These individuals we speak of as the cells. To examine a true individual cell requires a very high microscopic power, and together they appear like a honey-comb. They would be entirely round but for being pressed together; being pressed together they become angular. Each cell is the individual out of which the tree is made up, and whatever the tree is to be throughout its long period of existence comes from some original principle hidden in that one single little cell. The acorn itself, and all the different forms and shapes of the mighty oak—acorns of different forms and shapes—every part of the grandest tree, are all decided originally in one little cell. Of course, we are unable to take a cell and look into it, even by the aid of the most powerful microscope, to see what it is ultimately to become. If we take the cell of an oak tree, or the cell of a maple tree, or that of a cucumber or potato plant, they seem to be precisely the same so far as we can see. We see no essential difference either in that from the oak or in the cucumber. A single primal cell would not live long as an individual, so they unite to protect each other. One single cell would dry out and die; but a multitude of cells prevent each other from drying out. By doing what they can in this way they get some protection, but not enough. They require some external covering.

They provide what we call a cuticle, a bag as it were, to hold these marbles, simply a protection against the external atmosphere, to prevent the cells falling apart in the first instance, and to prevent the moisture drying them out too rapidly. There is no other object in bark primarily than these.

We might now pay some attention as to how the bark was made. A mass of individual cells have the power to form some cuticle in order to protect themselves. The cells on the outside of the mass form a cuticle or skin in that way. You can readily see how they operate by cutting the cuticle from some organic part, and it forms again by its inherent power. Take a potato and cut it in halves, and, if healthy, you find a new skin grown over the cut surface. But if the potato is diseased, instead of forming a skin over again, it dies and rots away. So where these cells are in a highly vitalized condition, they have the power to make the skin which covers them. If they have a low vital power, they cannot do it. So you see the cuticle, being a product of the cell, and the cell containing the essential characters of the whole subsequent growth, is one of the characteristics of the tree itself. Each tree will have its own style of bark.

If you take off a piece of the bark from the entire surface of a tree while the cells are in a highly vitalized condition, new bark will immediately cover the whole surface. That particular period of growth is about mid-summer or a little later. In former addresses I have told you how wood is formed; you know that the annual circle of wood is made and proceeds out of the circle of wood which was made a year before. The little cell on the edge of last year's growth is all alive and full of vital power. It makes successive growth of new cells till mid-summer, and a new circle of wood is the result. Each cell divides, a new cell or more cells spring from the old, and they thus divide a dozen times during the year. This forms the woody circle. It is the last cell produced during the season that starts the new layer of bark for the year following, and if none of the outer bark died away, you would find precisely as many annual rings of bark as there are of wood, though these layers are very thin, and never anywhere equal to the layer of wood. In the bark of a piece of chestnut twenty years old, there will be twenty annual layers of bark, yet the whole thickness of the bark will be less than an inch.

But, as I have suggested at the outset, there are processes in nature arranged for the destroying of the bark, and consequently the bark is continually falling away; and, therefore, it is that you do not always find the exact number of layers of bark that you find circles of wood. When the cells of last year germinate and make the new circle of wood, there may be a number of generations before the layer is completely formed, and, consequently, you have an eighth of an inch or a quarter of an inch thick, according to the number of cell generations. Each is weaker than that which precedes it, and it is on account of this variation that the annual growth is made evident. To see the annual layers of bark, take a chestnut and macerate a branch in water, and you will find each layer distinctly and easily separated.

Having sketched the way in which the wood is made, I wish to call your attention to the annual process of forming bark. Say about the 21st of June, which is near about the end of the annual growth of the wood, strip the tree of the bark, and in less than two weeks you will have another coat of bark around the tree. If you take it off any other time of the year, there is not sufficient moisture, and no new bark will be formed, because for want of moisture no new cells are formed; but if the tree be stripped about that time there will be the growth I have described. The production of bark from these late-formed wood cells may be seen by the naked eye, if examination be made from day to day.

There is another subject, the excrescences on trees, which will help us to understand the production of bark from a wood cell. Whilst the bark is made of wood cells, these excrescences are caused by wood cells proceeding to make bark cells; but which cells retained some of the wood-making powers. You have all noticed excrescences frequently on the bark of trees, sometimes so large that they may be nearly a foot in diameter. If you get the opportunity to examine, with the view of discovering the causes of these little excrescences, slit them, and when they are laid open you will not find anything but a thread connecting them and the wood. I I tried to find a large one to show you now; but could get only this small one from an apple tree. Large ones are attached so lightly they can be kicked off with the foot. Now the way they are formed, it may be profitable if I repeat. The bark is simply a layer from wood cells, and the excrescences start from a cell intended to be but a bark cell; but which, instead, retained vital power enough to go on making such cells as they had when they were a part of the original wood structure of the tree; in other words, in throwing off these cells to make bark some few of the cells retain a portion of the vital power which the wood cells possessed; they continue year after year to retain that power, and they continue with that wood-making power going on and making wood every year just as they would have done as part of the regular woody structure of the tree. They have continued in the place where a bark cell ought to be; but retaining a considerable portion of the character of a wood cell, and, although not as strong as the wood cell, still formed wood instead of bark cells. This can be proved by cutting them down vertically, and you will find them as in the wood of trees, making a weak circle of wood every year. I refer to them in order to more clearly express the next point which I wish to call attention to, and that is how the bark of the tree expands as the tree grows. Botanical works, as I have referred to in my opening remarks, say the rifts which we see in trees are there mechanically, because, it is supposed, as the wood expands the bark breaks to allow for the expansion of the tree. If this were true, it ought not, even from that standpoint, be an injury to slit up the stem of a tree to help the tree in what it is mechanically trying to do. But nothing is further from the fact. As I have already shown, there is no use in bark other than to prevent the action of the elements in drying out the moisture. As soon as it has served this purpose nature desires to get rid of it, and provides for destroying the bark in a very singular and interesting way. With the creation of the bark is formed, at various places on its surface, some cells, which physiologists call the "suber cells," from *suber*, the Latin name for cork. These cork cells are found on all wood, even one year old. They are seen as mere spots on some wood. You can see them more clearly some times than at others. An apple is no more than a metamorphosed branch, and the white dots in the skin are the analogue of the suber cells on the bark of the original branch. Here is a piece of sassafras with small white spots on it. [indicating,] and there similar dots in a piece of an apple tree, [indicating.] On this piece of cherry are the same dots seen. Here is a piece of paulownia, on which the suber cells are more clearly shown. These cells are provided by nature for the express purpose of arranging for the final slitting of the bark of the tree. What is more singular is every tree has its peculiar species of suber cells: but, as far as I know, no botanist has published much in regard to the matter. Here before me is a piece of sweet gum, in which the suber cells have developed so as to form large ridges of cork on the outside of the plant, and the small piece shows formations in regular stratas of cork on the young wood; and another piece of wood, the two or three years' old wood, over which the old cork is spread out, covering nearly the whole of the tissue, and forming large ridges on the outside. It is one of these extreme things that nature seems to delight in doing. It seems to be a decoration without utility, often noted by observers of nature. This is a case of that bountiful kind. She could have arranged these suber cells more guardedly without all this apparent waste, and could have done the cleaving work just as well; but in this case she seems to have tried to see how far she could go in the great variation she evidently loves to display in her work.

Now I have here a piece of silver poplar wood four or five years old, [holding up to the audience.] At this point the suber-cells have started to their destructive work, but you can hardly see them; but in this much older piece they have made cavities like diamonds, and in the course of two or three years' time the longitudinal points will meet. Here you have it in this part of the poplar wood, [indicating,] and the points have met, and the rifts complete. In the paulownia nature has three different grades of suber-cells, and the result of that is, when the branch arrives at maturity, there will be just three different sizes of rifts in the bark, simply because there are three different classes of suber cells there in the beginning. They spread longitudinally, and in due form make the rifts for themselves. Now take this piece of birch; instead of developing up and down, the cells develop longitudinally—they go around instead of up and down—and so with the cherry tree, and the bark hence comes off in sheets like sheets of tin. In that way nature provides for the slitting of bark in the cherry tree. Again, she takes her time to it. There are some trees with which it does not seem to be at all necessary for the fissure to take place at once, because there is more power of expansion in the bark cells than in others. In some trees the bark continues four years before there is any inclination of the suber-cells to dedevelop, in some six, and in some eight years, and in one tree, the chestnut, some twenty-five years before they grow and rive the bark. These little cork-cells never commence to develop to any serious extent until in each species the time arrives. With every tree you will find rough bark coming at different ages. The bark of the sassafras tree commences to split in about three years, and from that time you may trace the suber-cell in its upward and downward track—in three years they commence and in seven they show the particular rifted condition of the sassafras tree. There are some, as I have said, that progress upwards and downwards. All the illustrations I have given of this class, except the cherry and birch, which are horizontal. In other trees nature seems to operate beneath the cuticle, as in this case large piece of the button-wood tree, where the cork-cell develop rapidly and the cuticle falls off in flakes. It does not matter how old the button-wood, you never find the bark more than a quarter of an inch thick, because the peculiar development of the cork-cell development throws off the old bark continually. Rifts are not necessary to a button-wood tree.

The chestnut tree does not crack until twenty-five years old; the apple tree ten years; the oak twelve years, and so with every species of tree, each seems to have its own time, through the peculiar power of the suber-cells, and for no other reason. In the beech the vital power of the suber-cells causes them to develop as on the button-wood tree, only that they commence developing in the first year; and from the time the beech has commenced to form bark, from the first year. Through its whole life the bark never gets thick, but always fresh and young; about as you will find in young trees just starting in life, and throwing the old bark off in filmy flakes each year. In all those trees they seem to loose no time in forming and doing their work, and consequently the rift is not deep, or are never there. In the chestnut tree the rifts are two or three inches deep, some of them, simply because it is twenty-five years before the rift commences; yet you will find bark between the rifts, green and healthy, years after the rifts commence. The cork-cells only worked upwards and downwards, not extending to the space between. It is only where the cork-cells destroy the bark that any damage to it is ever seen. Bark might live an indefinite time if the cork or suber-cells did not destroy it.

Now with this knowledge of the use of bark—what it is intended for, and how it is made—and as we have seen how the plant is endeavoring to get rid of it, there is nothing against the agriculturist endeavoring to aid nature in doing what she is endeavoring to do herself. There is nothing, in my mind, but good common sense to watch and help to aid her in getting rid of this bark; nothing but good, practical common sense, if the agriculturist or fruit-grower shall find that the suber-cells are not opening the bark properly, to help them in opening it, by taking a knife and slitting the bark up. If the bark-cells lose some of their vital powers, the cork-cells are inoperative, and the whole exterior unable to swell in harmony with the growth of wood beneath. The slit, in that case, is certainly of great advantage. I have now given you the science of the splitting bark, but we need not depend entirely upon the science of the matter to prove the value of bark opening, for every day old-fashioned farmers in old-fashioned country districts prove it for us. I have seen over and over again trees not only washed with lime and soap, but the roots soaked with boiling water, by persons who take as much interest in trees as they do in their live stock, and yet never have seen anything but good results. I think, therefore, when it becomes a mere question between those who imagine there are breathing pores in bark, and that it has the varied powers which leaves possess—and between those whose every-day practice shows admirable results from the whitewashing and knfe-slitting practices, you need hardly wait for the confirmatory views which I think botanical science shows you really exists, as to the good effects of these oft-abused practices.

The question being open for discussion—

Mr. SMITH, of Luzerne. Do you object to whitewashing apple or peach trees?

Prof. MEEHAN. No, sir; I favor it.

Mr. SMITH. I had some very thrifty apple trees. I found this spring that the outside bark was getting loose, and I said to my man, "You go and take a sharp hoe, and take this loose bark off, and then whitewash the trees." Was that right?

Prof. MEEHAN. I think that was quite proper.

Secretary EDGE. Will the professor tell us something about removing bark for the purpose of making a tree fruitful, as the removing of the old bark on the longest day of the year.

Prof. MEEHAN. The removing of bark to make a tree fruitful is practically another question. There may be two reasons for removing the bark. In the first place, the tree may not be fruitful. Trees that are healthy and unfruitful, of course, are of no practical importance. Secondly, they may be unhealthy. I think that frequently arises from what farmers call a "hide-bound" condition. By removing the bark, or slitting it, you allow the expansion of the wood, and that tends to make the tree grow more readily than before. It may not be as fruitful at first, because free growth is antagonistic to fruitfulness, but in the end more fruitful, I think.

Prof. MCKEE. How about girdling the branches?

Prof. MEEHAN. The ringing of the tree has the effect of checking free growth, and thus helping the tree to become fruitful, if the tree is already in a vigorous condition, and does not bear well, by girdling at a certain season of the year, it has a very beneficial effect. There is a certain antagonism going on between what is called the tree's "vegetative force," and its "reproductive force," until the vigor is checked in some way, either through the top or through the roots, then the reproductive gains the advantage. When the fruitfulness or reproductiveness of the tree gets out of measure with its vegetative growth, there is antagonism. Therefore, if the tree be growing very vigorously, and the time has arrived that it ought to bear fruit, and it does not, then take off the bark or do anything that checks that too vigorous growth, and the result will be fruitfulness.

Mr. MUSSELMAN. We farmers are a great deal annoyed and bothered with warts on stock. Are those excrescences on the skins of animals the same as those excrescences on the bark of trees?

Prof. MEEHAN. I am not a zoologist, but I am inclined to think there is some analogy. Those better acquainted with animal life would be better able to answer that question.

Mr. SMITH. I saw in one of our agricultural papers the idea advanced of putting on plenty of salt where trees do not bear. I tried the experiment at one place for two years on plum trees, and last year those plum trees had a few plums. Do you suppose the salt had any effect?

Prof. MEEHAN. It is possible the salt had a beneficial effect. There are a great many diseases that spring from the roots, and salt might help a tree struggling with disease. No doubt, in many instances, insects attack vegetation and cause disease. It was undoubtedly the case in the great grape root malady in Europe. Disease follows such attacks. Various kinds of insects will attack the roots of trees when they have the opportunity. If the roots of trees be diseased, either from fungus or from insect attacks, then salt, or sulphur, or lime, or anything capable of destroying fungus life, but not of sufficient power to destroy ordinary vegetable life, would be an advantage. If some fungus growth attacks a fruit tree, then to use salt, I have no doubt, would be an advantage; but can see no other way in which a tree could be benefited as Mr. Smith found.

Mr. **Smith.** Those trees grew very large and thrifty. There was no lack of the thriftiness of the trees; but they did not bear.

Mr. **Herr**, of Clinton. Prof. Meehan stated that he believed in whitewashing trees. Does he make any distinction in the varieties of trees—whether it would have a different effect on the cherry tree than on the apple tree? I do not want to leave under the impression that whitewashing with lime would be injurious to one tree while beneficial to some other varieties. In regard to girdling trees, would it not be fatal to the growth of the tree?

Prof. **Meehan.** I think I stated that the 21st of June, or mid-summer, or about that time, there would be no injury in stripping off wholly the bark of a tree. At any other season of the year it is ordinarily destructive. Horticulturists, when they speak of girdling, generally do not take the bark off all around, but only two thirds or three fourths of the way.

As to whitewashing different trees, I do not recall any cherry trees having been whitewashed, but I do not know any reason why it should destroy them. I do not recollect any instance where whitewash extensively used on trees caused them to suffer. On the contrary I have seen advantages derived. It helps a tree to throw off what it is unable to throw off itself. It helps all trees.

Mr. **Keller.** If we were to divest the tree of all its bark, it would prevent the returning sap returning from the leaves.

Prof. **Meehan.** We hardly know what is the " returning sap.

Mr. **Keller.** The sap goes up through the fine cells and returns or runs from the leaf. Is not that the idea?

Prof. **Meehan.** That is the old idea, but it is very doubtful whether the tree behaves in that way. The sap goes from the roots into the leaves, and there a greater part evaporates and goes into the atmosphere. The general impression is now that the cells take what moisture they want as the sap ascends, and that there is a general absorption of carbonic acid by the leaves, and that the gases required by the plants descend as gases. I have my doubts whether there is anything, such thing as " returning sap," although it used to be the prevailing impression.

Mr. **Keller.** Then the tree would perish.

Prof. **Meehan.** You have no idea of the immense quantity of water drawn up and evaporated during the season from a few leaves, and I doubt whether there is any left to be returned. By experiments carefully made there is no evidence clear to my mind of the return of the sap, or of the old idea of sap returning. We tie a label around a tree, and find above the bandage that the tree is thicker than below, and we naturally infer that it is caused by the return of the sap, or something of that kind; but we have not found it is the case. We find on the contrary that the cells have increased faster and in greater quantity than below, and that is proved by miscroscopic examination. By cutting across above we find a greater number of cells than there are below. There may be the annual circle of wood of fifteen or twenty courses of cells before the growth ceases. We find that the germinations of the cells have not been as fast below as above, but I do not know there is any reason for believing that there is a return of sap.

Mr. **Keller.** When you destroy the thick pulp of the tree, right within the bark, will it not perish?

Prof. **Meehan.** Yes, sir; the most active part of the tree life is under the pulp of mass between the bark.

Mr. **Herr.** I should like to ask the professor if the spots occurring on peach trees are not a kind of blight? I notice the same is on my pear trees—my Howell, and a seedling, and one or two other varieties. At one place it almost girdles the tree. I have taken my knife and cut off the bark until I came to the growing soft bark underneath. I did not know what to do with it, and I am awaiting the result. Is it blight, or a species of blight? and, if so, how can it be remedied?

Prof. **MEEHAN.** It is one of several species of fungus growth which attacks half-dead bark which does not seem to have any power when there is vigorous life in the bark, but when the bark of the tree is nearly dead it spreads. It has no power on the highly vitalized, or very rarely extends into the healthy part. It is an injury so far that it prevents the sap passing underneath the bark, and so cuts off the supply of food. I have never known any serious results.

Mr. **HERR.** The bark seemed to be dead.

Prof. **MEEHAN.** It is soon dead after being affected, and not perfectly healthy at the start. The fungus appears in spots, and, once established, it spreads slowly to adjacent parts.

Mr. **HERR.** It occurs in spots on healthy looking pear trees.

Prof. **MEEHAN.** Yes, sir; it may do that. The trees themselves are healthy, it is only the bark which has lost vital power.

ENSILAGE:

Its History, Cultivation, Preservation, Cost, and Value as Stock Food.

The large amount of correspondence, and the number of inquiries referring to and relating, directly or indirectly, to ensilage and its cultivation and preservation, which have reached the office of the Board during the latter part of 1881 and the early part of 1882, has led to the collection of the most reliable data attainable, and it is the sole wish and duty of the writer to consolidated and condense this information into a form which shall render it available to the general reader.

In many cases, this necessary condensation, compelling, in many cases, the omission of much of the correspondence, destroys the continuity of the original writer's ideas, and gives to them a form for which the Secretary of the Board is alone responsible. In many cases, where a duplication of ideas, modes, or facts ensues, the Secretary has felt compelled, from a want of space, to omit one or the other, and in making this choice care has been taken to give all a fair hearing, and it is hoped that none will feel themselves slighted by the omission of any information which they may have furnished, and that they will attribute its omission to the sole cause, viz: a desire and necessity for the avoidance of any duplication of matter where all must be so much condensed. It has been thought best to present this evidence, as much as possible, in the form in which it reaches the Board, and allow the general reader to draw his own inferences as to the facts involved, without any attempt on the part of the writer to draw conclusions for the reader.

History.

The name by which this peculiar process is designated is evidently of French origin, and is a compound of two words—en and silo, (*en*, in, and *silo*, a pit,)—and is one of the few terms which, while it designates the article named, also explains the process by which it is produced. Thus, ensilage is food preserved in a pit or silo, and the term may be very properly applied to any kind of food thus preserved. Hence, in standard European works on the subject, we have the terms, "ensilage of maize." "ensilage of clover," "ensilage of grass," &c.; but in this country, custom has almost universally applied the term to the preservation of green corn-fodder, and an investigation shows but few attempts to use any other material for filling silos. The reason for this is, no doubt, to be found in the fact that our climate permits of the proper drying of almost all the crops by the old and common plan of making them into hay; but its large bulk, the shortness of the days, liability to rain, and other causes, prevent the successful application of drying to large masses of green corn-fodder.

The early history and origin of this mode of preserving stock food is not very clear, and, as a natural consequence, we have various theories and suggestions. H. R. Stevens, who has probably traced the matter as far back as any other writer, concedes its origin to Goffart, of France, but does not fix the date. He, however, gives the following quotation from Greiswald, as early as 1842. Greiswald writes:

> "A curious mode of preserving grass for forage, instead of making it into hay, has been tried in Germany, in East Prussia, and it is this: Pits are dug in the earth, ten feet or twelve feet square, and as many deep. They are puddled with clay, and lined with wood or brick. Into these pits four or five hundred weight of grass, as it is cut, are put in, a layer at a time, sprinkled with salt at the rate of one pound to one hundred weight, and if the grass is dry, that is, free of rain or dew, two or three quarts of water are sprinkled over the layer. Each layer is trodden down by five or six men, and rammed firm, especially round the edges, with wooden rammers, the object of which is the exclusion of air. A little straw is then scattered over the layer, to mark its dimensions afterwards. Layer is placed above layer till the pit is filled to the top, when the topmost layer is well salted, and the pit covered with boards or a well-fitted lid, upon which is put a covering of earth of one and a half feet in thickness. Such a pit will contain five layers of grass, and should be filled in two days. The grass soon ferments, and in about six days subsides to half its original bulk. The lid is examined every day, and every crack in the earth filled up to exclude the air, which, if allowed to enter, would promote the putrefactive fermentation in the grass. When the first fermentation has ceased, the lid is taken off and fresh grass put in, trodden down, and salted as before. The pit will now contain about ten tons of grass, equal to two or three tons of hay. The pits should remain shut for six weeks before being used, and then are used in succession. The grass thus treated has the appearance of having been boiled, and its sharp acid taste is very agreeable to cattle; and twenty pounds a day, with chopped straw, will keep a cow in good condition all winter, and twenty-eight pounds will cause a cow to give a rich and well-tasted milk."

It is true that the process as described by Greiswald only refers to the use of grass, yet his description is so plain, and all of the essential points are so well covered, that, except so far as the use of salt is concerned, his text, as quoted, includes all we now have in relation to the process. If, as is claimed, Goffart added maize or green corn stalks—he did not in any material point vary the process. Since the time named, this plan of keeping winter provender seems to have made rapid progress in France and Germany. Corn stalks, clover, sorghum, beet leaves, and other forms of succulent and rapid growth have from time to time been added to the list of ensilage crops, and it is still an unsettled question whether the puddled pits of Greiswald are not as good or better than the more expensive silos of the present time.

Although tested on a correspondingly small scale in this country, the full prominence and possible future value of this plan does not seem to have been noticed until it was clearly demonstrated that the hay crop of 1880 would be a short one. In their pursuit of crops with which to supplement the short hay crops, our dairymen naturally planted increased areas of "fodder corn," rye, amber cane, and other crops of rapid growth. Just at this time the subject of ensilage was brought before the reading public by the agricultural press of the country, and the "ensilage fever" soon reached its present proportions. And whether ensilage shall remain a permanent item in our bill of fare for live stock, or whether, like roots and steamed food, it must give way to cheap corn—a competition not met with in Europe—remains to be seen. In any event, it seems evident that the extent of its adoption will vary very much with the annual yield of hay, and that, as one of our practical correspondents writes, "the farmer who has plenty of good hay and corn meal, will not bother himself much about ensilage.

Plans for Silos and Mode of Filling.

In accordance with our previously described plan, we here introduce a letter showing the plan of building pursued by the writer, and must leave it for our readers to select the one best suited to his purposes, crop, and pocket, but would here suggest that in the selection the plan of Greiswald be not lost sight of.

J. Winslow Jones, of Portland, Maine, thus describes his silo:

"I have had to abandon my silo made in the ground and bricked up. I could not keep out the water. The only places where a silo can be made profitable is in very sandy ground, and on side of a hill. It is easier to build a cistern to hold water in the ground, than it is to build one to keep the water out. Every year water has worked in from the outside, and spoiled my ensilage. I have heard others complain of the same thing. My barn is raised up so that I have a cellar under it, and the bays go to the bottom, and the barn is twenty feet posted, making my silos thirty feet high, which I think a great advantage, as by having a great height the ensilage settles better. I have this year put in about three hundred tons, and it comes out beautifully, and cattle eat it better than the best of hay, and do not require meal. I have gained oxen this year at the rate of one hundred pounds per week to a yoke, and cows will give a third more milk than when fed on hay and meal.

"This season I have just lined up my bays inside with single boarding. This keeps the timbers from rotting, and answers every purpose. There is a little mold round the edge, but I mix it right in, and the cattle eat every particle right up clean. I kept filling the silos right along together, and was about two months filling them, kept them open and put no weights on till after I was done filling. It is much more convenient feeding from barn, and but little more work to hoist it. Ten tons of it do not require more space than one ton of hay, and from the best calculation I can make one ton is equal to twelve hundred pounds of hay. This may be a little high, but is based on observations of good careful men. Still we better not set it too high—that is a mistake of all writers—let us call it eight hundred to one thousand pounds equal to a ton of ensilage. In making silos as high as mine, I have had to put some timbers outside the barn, about eight inches square, supported by rods running through between the bays, to keep the barn from bulging out from the great pressure. The great secret of keeping is to get it in very solid and thoroughly trod.

"I mean that I was two months filling. and put no weight on during that time, and I consider it an advantage to be a long time filling. I had enough, so I filled every day or sometimes every other day—sometimes there would be three days I would not fill any, but I used to tread it down every day on the silo, within three or feet of the top, the weight of the ensilage is just as good as the weight of rocks. This is the advantage of having the silos high, say twenty feet. For the three or four feet near the top of the silo, the constant treading is better than a still weight. When, for instance, we put in a certain amount to-day, the heat making a sort of moisture that softens the

material, so that it packs much closer, and when you go in to tread the next day, even where it is trod very closely the day before, gives several inches, and in that way you get the whole packed very solid. You want to give your silos a thorough treading every morning before adding anything."

Captain P. R. Stetson, of Heidelburg township, Berks county, Pennsylvania, thus describes his silo and his mode of filling it:

"I made my silo in the wagon shed, a space at the end of the barn, thirty feet long, fourteen feet deep, and twelve feet wide. By using this place I had already the sides and back walls, each twenty-six inches thick. I then put up a front wall of the same thickness, with double doors, six feet high and three feet wide. A good coating of cement on sides, ends, and bottom, was applied, and I had as good a silo as could be built. I planted four acres with southern white corn, the land having been prepared with a heavy coating of manure. The corn was in the ground by the 15th of June, but the most of it, owing to worms and bad seed, had to be re-planted. The drills were four feet apart. By August 12, the corn was ready for cutting, ears the size of one's thumb having formed, and the stalks being full of milk. Owing, however, to the severe drouth the corn was not in the condition it should have been. We began to pit it on the 12th of August, eight men and boys, with one four-horse wagon, having been occupied five days in doing the work. The corn was cut with the common knife, as near the ground as possible, taken to the barn and run through a fodder cutter, cutting it in pieces half an inch in length. Two men were in the pit to spread and tramp it down. It could not quite fill the pit, owing to the corn giving out. Over the fodder six inches of long straw was spread and upon the straw two-inch planks were placed, weighting it with stone and sand in bags—one thousand pounds to each square yard of surface."

E. W. Washburn, of Lennox Furnace, Massachusetts, under date of January 23, 1882, writes as follows:

"We now have two silos of about two hundred and one hundred and seventy-five tons capacity, the larger one built in 1880, at a cost of less than $300, and the smaller one, the past season, at a cost of $160. With the exception of a little bank wall of heavy stone around the bottom, both are built of concrete, made of Rosendale cement one part and gravel five parts, with all the small stones we could pack into the mortar.

"We have used in their construction eighty-three barrels of cement and over seventy loads of gravel. The outside walls are from twelve to twenty inches thick with the taper on outside.

"The silos are built partly in my barn, and are filled from the barn floor over the top of the wall.

"The doors for emptying are in the stable, and only about ten feet from the cattle.

"My crop for ensilage in 1880 consists of corn and millet, in the proportion of three of corn to one of millet, and was ensilaged when the corn was earing and the millet was just beginning to show the head. The silo was covered with plank and weighted at from twenty-five to seventy-five pounds with stone to square foot.

"The preservation was not perfect under the lightest pressure, but the seventy-five pounds seem to be about sufficient.

"This was fed with hay and grain, and gave results equal to my most sanguine expectations.

"Our crops the present season consisted of one hundred and ninety-two tons of corn and ninety-one tons of millet, counting forty cubic feet of compressed ensilage one ton.

"The whole cost of the corn in the silo, aside from the manure, $1 33 per ton. The corn was raised in drills three and a half feet apart, three stalks to the foot. Variety, Southern white.

"The whole cost per ton for millet in silo, aside from the fertilizer, was $1 03.

"The corn was cut by hand in the field, and the millet with a reaper. Wages for men $1 50, for team and man $4 per day.

"In one silo was put one hundred and thirty-five tons of corn, in the other fifty of corn and ninety of millet. The silo that was filled with corn has been all fed, and the preservation was found perfect throughout the entire mass."

O. B. Potter, of New York, writes:

"Silos should be made from seven to ten feet wide, and as deep as possible, with close walls, and doors dividing them, as shown in my report. The reason of this arises from the fact, that, when you fill a silo, it is best to fill it up as soon as possible,—not more than one to two days,—and then cover it from the air, and leave it to ferment and settle as fast as it will, while you fill the next. If your silo is so large that you can put but a foot or two in depth in it by one day's work, it will not ferment as well as if filled and covered and left to ferment. Sections should not be more than twenty feet long, ten feet wide, and fifteen feet deep. It will take about seventy-five tons of green corn, before cut, to fill one section, and from one to two days to fill it the first filling.

"It is also important the sections be small, in order that when opened for second, third, or fourth fillings, as each must be, the fermented and heated mass then in the pit be exposed to the air as little as possible, and, when only a small pit is opened, the new fodder can be at once poured in, and the air will yet be excluded from the heated mass below."

Joseph A Roman, of Colora, Maryland, writes:

"In the spring of 1880 I dug out and walled up a pit twelve feet deep, 8×12 inside the wall. This was intended for an ice-house. My attention was called to the ensilage question. We 'pointed' the wall with lime morter, *i. e.*, filled the face of the wall between the stones. After this was dry, we broke six inches stone in bottom. Then with four barrels of Rosendale cement gave the bottom and sides as smooth face as possible. I plowed four acres of *wheat stubble*, planted the corn thickly in rows three feet apart, got it in July 12. The season proved dry and it made small growth. By October 5 it was fully in tassel, and I thought as fit to cut as it would ever be. With an old one-horse tread power and a No. 2 Telegraph cutter, which I bought second hand, with help of three boys, the oldest eighteen, we put three acres of the fodder through the cutter and into the pit in three days, being well tramped while putting in. We covered a little rye straw (straight) one foot thick, which pressed to four inches and almost rotted as did a like depth of ensilage. My well had been built with a 'batter,' *i. e.*, the space bigger at top than bottom. When I cut the planks I did not allow sufficient for the sinking of the green stuff, consequently the planks, which were two-inch white oak, bound across the silo, and could not settle evenly, so that there were moldy places for considerable distance into the mass of ensilage. I opened the silo January 1, 1881, found the stuff quite warm, and by placing a few bushels on the barn floor it would heat in the coldest weather. I used the ensilage in feeding cows. With corn meal alone it proved a very unsatisfactory feed, by feeding two quarts wheat bran, one quart corn meal, one pint cotton seed meal, and twenty-five pounds of ensilage twice a day, with a mid-day feed of hay or corn-fodder, the cows did well. Withholding the ensilage would always show by a decrease in the yield of milk. In May, 1881, I planted two acres with yellow corn, in rows eight to twelve stalks to the foot. When the thin places had ears almost fit to eat, we ran it through the same cutter with same power, until we half or more filled the silo. We then took corn planted as regular field corn, three by four feet, of large growth and big ears, many of them suitable for boiling. With this we filled the silo, heaped up, packed down, and running over. We put the plank on the ensilage directly, then weighted very heavily, it settled evenly and nearly two feet. I opened this the 27th December. It was sound throughout and pressed very solid. No heat, but the pieces of large stalk very sour."

C. W. Garrett, Enfield, N. C., writes:

"I built two *wooden silos* under one roof, each twenty feet long, twelve wide, and ten deep, and mostly above ground, to wit: I dug in the ground two feet deep, forty-three feet long, and fourteen wide. At the ends and sides of this hole, I placed good heart white oak sills, twelve inches square; into these I fastened studs, two inches thick and six wide, fifteen feet long, three feet apart, every alternate stud outside the bottom sills, the other inside. To these studs, outside and inside, I made separate walls with one and quarter inch plank, edges jointed, and fitting like a floor; between these two walls was a space of twelve inches all around. This space I filled with dirt, rammed in such manner as to exclude the possibility of the air passing through to the ensilage. I framed a sill, same size as the others in the middle, and made a partition in same manner as the outside walls, as stated. My silos are ten feet deep, thus leaving a space between the walls and plates on top of the studs of five feet, which is necessary for filling and weighting them, When filled, I cover this ensilage with two thicknesses of inch boards, breaking joints; upon these, I put six inches of dirt, and upon this I put green pine poles, any size convenient to handle, four feet deep, and if more all the better, as there is no danger of getting on too much weight. I have a door in the outer end of each silo, protected with dirt from the air, the same as the walls, two feet from the bottom, five feet high, from which we take the ensilage, as the planks on top are laid lengthwise the silo. After taking out to the distance of about two feet, I put props under to support the weights on top, and other props as we penetrate into the silo when feeding."

The correspondence at hand, other than that quoted, (enough to nearly or quite fill this report,) proves that the silos may be either above or below ground, but that, to prove a success, the silo must be, as near as possible, air and water tight, and must be well weighted and covered. The plans given in our correspondence vary from the ice-house, or old lime-kiln, and pit dug in a compact sub-soil, to the expensive brick or cement structure, costing $1,200, and it would seem that the percentage of success was nearly the same in each case.

Cost.

Under date of December 19, 1879, Mr. G. Goffart wrote to Mr. J. B. Brown, of New York, as follows, (see proceedings of Ensilage Congress in New York,) as to the cost of ensilage:

"The longer experience I have in feeding ensilage to stock, the more I am convinced of its great value. I have taken from the account books of my Domaine of Burtin the cost of the culture and ensilage of maize the past season. In reckoning six per cent. of the weight of the animal for its daily food, I arrive at an expense of three and three fifths cents per day to feed an animal of thirteen hundred and twenty pounds. I know of no fodder which costs so little as my maize, viz: ninety cents per ton; and this notwithstanding the year has been unfavorable to maize.

"Account of cultivation and ensilage of two and one half acres of maize, equal seventy-five tons.

Deep fall plowing,	$4 09
Harrowing,	57
Spring plowing,	4 09
Harrowing,	57
Manure, $10 26; cartage, loading, spreading, $2 40; total, $12 64; charge one half to this crop,	6 32
Guano, four hundred and forty pounds, at two and nine tenths cents,	12 76
Seed, two hundred and twenty pounds, at two and five eighths cents,	5 80
Sowing broadcast,	18
Plowing in seed,	2 23
Harrowing,	57
Cutting with sickle,	5 02
Loading on wagon,	2 79
Carting,	4 65
Cutting,	2 79
Filling,	93
Covering, (silo containing six hundred tons,)	25
Wine to employé, twenty quarts, at ten cents,	2 00

Use of engine and cutter,	$1 86
Wood for fuel,	1 86
Oil for machinery,	19
Fireman,	85
Rent of ground,	5 58
Interest one year, at five per cent., on above expenses,	3 30
	$69 25

"Total cost, ready to be fed, 87½ cents per ton, or $28 08 per acre."

Mr. Stetson, of Berks county, Pennsylvania, writes:

"The cost of the ensilage was as follows:

Plowing and cultivating four acres,	$12 00
Hire of eight men and boys,	37 00
Seed corn,	8 00
Cost of silo,	47 00
	$104 00

"I opened the pit on the 16th of November, and found the fodder in good condition. From the beginning, the cows eat it with relish, leaving good hay or corn-fodder in preference for it. The ensilage had settled about eighteen inches. I think I had about eighty tons in the pit, at a cost of $1 30 per ton, (including cost of silo.) It is safe to say that this year I shall be able to put in one hundred tons, (the capacity of the silo,) at a cost of not more than seventy-five cents per ton."

The average of a large number of estimates and experiments as to the cost of ensilage per ton is very nearly $1 05, and varies from 25 cents to $2 50 per ton, the latter caused by a partial failure of the crop.

Practical Results in Feeding the Crop.

On this topic Mr. Stetson, of Berks county, Pennsylvania, writes:

"I have fed the ensilage since November to twenty head of cattle, giving each forty pounds a day, with two quarts of bran. The cattle have improved in every way, the flow of milk being much better, and their general appearances indicating perfect health. Each head has had ten pounds of hay per day. I shall have enough ensilage to last until the middle of April. I am quite sure I can feed at least one third more cattle on my farm with ensilage, than with dry corn fodder and hay, and have them in better condition in the spring. There can be no failure in the preparation of ensilage, a little care and attention at first being all that is necessary. When once the weight is on all the trouble ends. The expulsion of air is the secret of success. The silo must be perfectly air-tight. My advice to the farmers of Berks county is that every one of them build a silo, and they will never regret it."

J. A. Roman, Colora, Maryland, writes:

"I have tried some of the cows on ensilage diet alone, they do not do well, and soon tire of it. With corn meal and bran they milk well but are too loose in bowels and look hollow. With all the dry feed, hay, fodder, or straw, they will eat, they do very well, decidedly better than without the ensilage, nor do they eat nearly so much of the dry feed, probably one third as much as they would eat without the ensilage. To my view, judging from experience, corn fodder ensilaged is only to be considered as so much added to the stock or dry feed, not to take the place of it. Not something to enable us to 'sell all the hay,' but rather something to enable us to feed profitably all the hay, straw, fodder, and 'roughness' of the farm, together with all the grain, which the money some of us now pay for commercial fertilizers will buy. I may say that, practically, there is no such difference in favor of large grown stalks of corn as Bailey and others pretend, the fact is the hard hull or outside of a big stalk, even when cut very short, is objectionable to the cows, they always eat the leaves and smaller stalks first, and if full fed leave the butts even when *shreded*. My work horses are fed on ensilage in addition to their dry feed, with decided help to them, they show the effect in their improved condition much sooner than cattle, they also prefer the small grown fodder, that is the thickly planted. Young calves, from four weeks up, eat small portions with benefit. Hogs in pen will eat considerable quantity, and are the only animal I have found, which choose big stalk. Chickens during snow or freezing weather will eat very considerable."

J. O. Schimmel, of Philadelphia, gives the following practical results of his experiments in feeding ensilage:

"This subject of feeding ensilage has been much discussed during the past few years and its great importance to the farmer is my apology for presenting this note. My experiment with ensilage during the past season may be considered as having been attended with minimum success. Anyone wishing to make a trial of it need fear no worse results.

"The cultivation, preservation, and feeding was as follows: A four acre field, which the previous year had yielded thirty-seven bushels of corn per acre, was manured with ten two-horse loads of stable manure to the acre. The corn was planted the latter part of May, in rows three feet apart, seeds from three to five inches apart, dropped and covered by hand. The corn was cultivated twice, after which it did well until the long drought of last summer set in, and then a miserable struggle for life ensued, which was kept up until the 23d of August, when it was decided to put the corn in the silo to prevent its too great deterioration. It was cut one third of an inch in length. While the silo was being filled two men were constantly kept walking on the ensilage so as to pack it firmly. It was covered with a double layer of hemlock boards and weighted down by about one hundred pounds of stone to the square foot. This was hardly enough, as one hundred and fifty pounds should be the average weight when the ensilage is to be kept over the winter season. The cost of harvesting and filling the silo was about sixty cents per ton, which is about one half the cost of its production, not reckoning the manure. The 15th of November was the time decided on to open the silo and to commence feeding ensilage. It was found to be well preserved and weighed forty-six pounds to the cubic foot, and from this it was estimated that the crop had produced at least ten tons to the acre. At first twenty pounds were fed per cow daily, which was gradually increased to forty pounds. In addition a mess of six quarts of mixed bran and middlings, with three pounds of meadow hay, was fed once a day. This allowance kept the cows in a full flow of milk of the best quality. After the ensilage had all been fed and hay substituted, the milk dealer greatly complained of the difference in quality of the milk.

"Owing to the prolonged drought the yield did not exceed half a crop. Its feeding value was likewise greatly impaired, for the stalks were not more than half developed. The best results may be expected when the corn is full grown and cut while in bloom.

"According to my experience, two pounds of ensilage was nearly equal in feeding value to one pound of hay. Its superiority over hay for milk cows have also been well illustrated by this experiment.

"On good corn land an average crop of corn fodder per acre may safely be estimated at from twenty to forty tons in ordinary seasons—the food value of which is equivalent to from eight to twenty tons of hay.

"The importance of this new system of growing and preserving animal food is so great that all concerned in agricultural affairs in our good old State should lend a helping hand to bring about its adoption by our farmers, and especially those of the eastern half, where, under the admirable system of small farms, ensilage would prove to be highly profitable. It would enable us to carry from three to four times as much stock. This would mean an increase of our dairy products to the extent of three hundred per cent. It would also naturally follow that the amount of stable manure would be increased in the same ratio, the application of which to our soil would double the average yield of our cereals. This would lead to the more general raising of cattle, sheep, and hogs. . And thus ensilage would be the means of increasing largely the chief agricultural products of our grand old Keystone."

Experiments at Farm of Michigan Agricultural College, Lansing, Michigan, by Prof. S. Johnson.

"Four lots of cattle were selected for these experiments, and results are given on each lot, and on the individual animals. The steers and cows were turned out to pasture during the day, and stalled only at night previous to feeding. In the progress of the experiment, the animals were fed regularly three times daily, at half past six, A. M., noon, and five, P. M. They were watered in the stall at eight, A. M., and again just before feeding at night. The milking was done just before the regular morning and evening feedings. Great regularity was practiced in their care.

"Lot one of the cattle consisted of two milch cows, Ayrshire and Short-Horn, that had dropped first calves early in September of the same year. We give Prof. Johnson's report of lot one:

"During the first fortnight, this lot had a daily ration of fourteen pounds meal, sixty-two pounds dry cornstalks, and thirty pounds roots—a full ration. During the second and third fortnights, the daily ration was fourteen pounds meal as before, and one hundred and nine pounds of ensilage—a full ration during the second fortnight, but the cows would have eaten more ensilage during the third, had it been given them. During the fourth, fifth, and sixth fortnights, the daily ration was again fourteen pounds meal, and one hundred and twenty-nine pounds ensilage—a full ration.

"Here are the results: First fortnight—average gain in weight, four pounds; average milk yield, 421.5 pounds; daily average milk yield, 30.107 pounds. Second and third fortnights—average gain in weight per fortnight, one pound; average milk yield per fortnight, 392.75 pounds; daily average milk yield, 28.054 pounds. Fourth, fifth, and sixth fortnights—average gain in weight per fortnight, two thousand four hundred and sixty-pounds; average milk yield per fortnight, 362.17 pounds; daily average milk yield, 25.869 pounds.

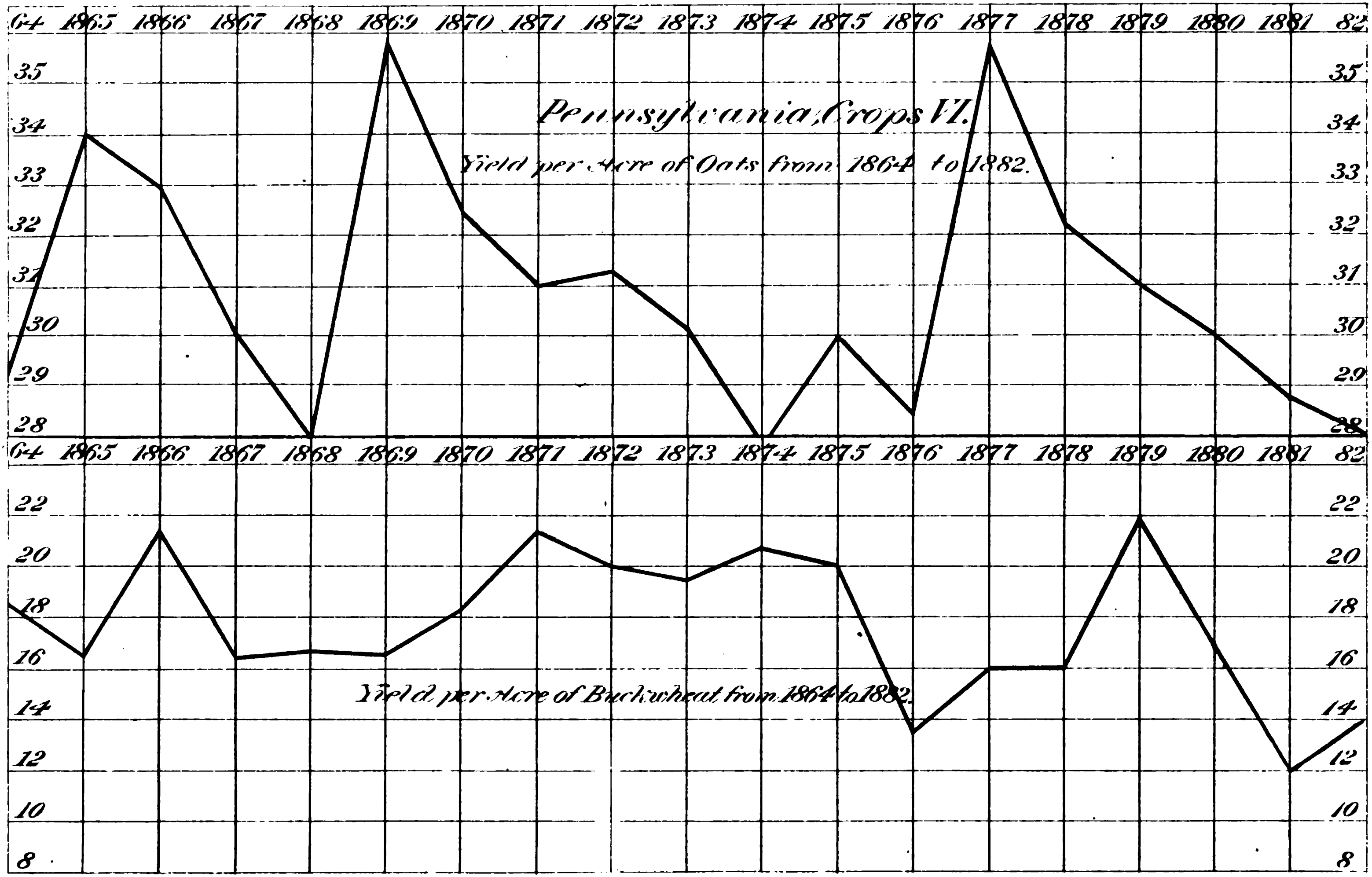
"Although the ninety-two pounds of roots and fodder had been entirely substituted by one hundred and nine pounds ensilage—little more than pound for pound—the returns of the second and third fortnights are tittle below the first; and when the ensilage is increased during the next three fortnights to one hundred and twenty-nine pounds—less than one and one half pounds ensilage to one pound of fodder and roots—the results are considerably better than during the first period. Of course, in interpreting the results of the above feeding, the natural shrinkage in milk yield must be taken into account. That the above shrinkages are not great, the following comparison will clearly show. Stewart Queen—the only other cow that became fresh at the same time of year, dropped her first calf August 28, 1881. This cow had all the dry cut cornstalks she would eat, a little hay occasionally, a meal ration, richer but a little lighter than that of lot one, and during February, a peck of roots daily.

"Here are the figures: Stewart Queen—weight December 31, 1881, 1,040 pounds; weight February 23, 1882, 1,000 pounds; loss in weight, 40 pounds; daily average December 1-15, 9.17 pounds; daily average February 1-23, 8.15 pounds; per cent. of shrinkage, 16.07 pounds. Lot one—average of two cows—weight December 31, 1881, 1,080 pounds; weight February 23, 1882, 1,120 pounds; gain in weight, 40 pounds; daily average December 1-15, 15.05 pounds; daily average February 1-23, 12.67 pounds; per cent. of shrinkage 15.81 pounds.

"Stewart Queen is three and one half years old, and Nos. 1 and 2 of lot one, three and thirty-five twelve years respectively.

"It will be seen at once, from the above figures, that the cows in lot one, not only gave on the average, about five pounds more milk daily apiece, but their per cent. of shrinkage is less than that of Stewart Queen. Nor is this all; for the cows of lot one gain forty pounds in weight apiece, while the other cow loses forty pounds. A reference to the table will show, too, that the gain in weight of this lot was almost wholly upon the meal and ensilage ration.

"The meal fed to the cows is worth twenty-two dollars and forty cents per ton. That fed to the bull-calves, twenty-five dollars. Hay is worth ten dollars, and cornstalks and oat straw, each five dollars per ton, and rutabagas forty cents per bushel. Compared with the other feeds at the above rates, the ensilage has a feeding value four



Pennsylvania; Crops VI.

Yield per Acre of Oats from 1864 to 1882.

Yield per Acre of Buckwheat from 1864 to 1882.

times the cost of growing the crop and putting it into the silo. I was not at all sanguine, when we began the experiment, as to the decided merits of ensilage as claimed by many writers, but I have been much pleased with the result of the feeding. The convenience in handling the prepared fodder; the large amount that can be stored in a small space; the avidity with which cattle eat it, and thrive and grow, when a meal ration is fed with it; the fact that it can be stored in a wet time, during lowery weather, when fodder could not be cured; the furnishing of succulent food for stock during our long winters at small cost—these are some of the reasons that led me to think the ensilaging of corn especially, will prove to be a practical and profitable method of preparing food for stock. I think it may take the place of roots, and be a cheap substitute for them. I am disposed to believe that the best results will be secured by feeding one daily ration of dry fodder in connection with the ensilage. The experiment shows that it is not a complete food ration. A meal ration adapted to the animal, and the desired result must be fed with it. The winter has been exceptionally favorable for the feeding of fodder of this character, on account of its extreme mildness, the mean temperature having been about twenty-eight degrees during the time embraced in the feeding. With severe weather, the result might be less favorable."

Experiments as Reported by Prof. George H. Cook, of New Jersey Experimental Station.

Prof. Cook states that the questions to be determined by the experiments were as follows:

First, is the loss of food, by fermentation, when green fodder corn is dried in stacks, greater or less than when it is preserved in a silo? Second, is ensilage more valuable for milk production than dried fodder corn?

To study these questions an experiment was begun on the college farm on the first of September, 1881. At that time the corn was in the milk, the stalks were very rich in cane sugar, and all conditions apparently were favorable for the trial.

The amount of available green fodder corn, by actual weight, was ten tons. Of this one half was arranged in the field in fifty small stacks; while the other half, after it had been cut by horse-power into lengths of three sixteenths of an inch, was closely packed in a silo of about twelve tons' capacity. The analysis of a sample taken with the utmost care to represent the entire quantity used in this experiment, gives the chemical composition of the corn before it was affected either by loss of moisture or by fermentation.

About the last of November, after an exposure to the weather of nearly three months, twelve hundred pounds of the dried stalks were passed through a Lion cutter and crusher, then thoroughly mixed and sampled. The analysis of this sample, compared with that of the original green corn, shows the changes which occurred during the process of field curing.

On the 23d of December the contents of the silo were found to be in an excellent state of preservation. A sample taken eighteen inches from the surface was entirely free from disagreeable smell, insipid to the taste, and as shown by the analysis, equal in all respects to the best ensilage which has yet been received at this station. The chemical composition of these three samples can be seen in the following table. It should be remembered that sample No. I represents the green corn, while samples Nos. II and III represent fodders obtained from this corn by two different methods of preservation.

TABLE NO. I.

	No. I. *Green Stalks.*	*No. II.* *Dried Stalks.*	*No. III.* *Ensilage.*
Water,	75.00	39.37	74.70
Ash,	1.58	4.63	1.95
Protein,	1.25	3.84	1.75
Fat,	.22	.66	.27
Fiber,	6.35	18.65	7.86
Carbhydrates,	15.60	32.85	13.47
	100.00	100.00	100.00

On account of the different amounts of water in these samples their relative compositions are not plainly seen. Comparisons between them can be easier made by arranging the results in another table, in which the composition of one hundred pounds of the dry matter of each sample is given. Table No. II is computed for this purpose.

TABLE NO. II.

	No. I. *Green Stalks.*	*No. II.* *Dried Stalks.*	*No. III.* *Ensilage.*
Ash,	6.32	7.64	7.71
Protein,	5.00	6.38	6.92
Fat,	.88	1.09	1.06
Fiber,	25.40	30.76	31.07
Carbhydrates,	62.40	54.18	53.24
	100.00	100.00	100.00

The ash of cornstalks is that portion that cannot be destroyed by fire. It is not in the least affected by fermentation, nor is it probable that its total amount was in any way changed either after the corn was packed away in the silo, or after it was stacked. It is, therefore, adopted as a standard in comparing the above analyses.

It has been shown that one hundred pounds of the green corn contained seventy-five pounds of water; four hundred pounds therefore of this corn would have yielded one hundred pounds of dry matter, containing 6.32 pounds of ash. The question now is, *whas is the weight of the dry matter in the ensilage, and in the field-cured stalks, which contain 6.32 pounds of ash?* A simple calculation from the figures in table No. II gives the following result:

TABLE NO. III.

	No. I. *Green Stalks.*	*No. II.* *Dried Stalks.*	*No. III.* *Ensilage.*
Ash,	6.32	6.32	6.31
Protein,	5.00	5.24	5.67
Fat,	.88	.90	.86
Fiber,	25.40	25.44	25.49
Carbhydrates,	62.40	44.82	43.64
Total dry matter,	100.00 lbs.	82.72 lbs.	81.98 lbs.

Eighty-two pounds of the dry matter of the ensilage and eighty-two and three fourths pounds of the field-cured stalks now contain the same weight of ash which one hundred pounds of the dry matter of the green corn contained. *During the process of field-curing, therefore, four hundred pounds of green corn lost seventeen and one fourth pounds of dry matter; while four hundred pounds of green corn packed in a silo lost eighteen pounds of dry matter.* Table No. III shows further that neither the field-cured corn, nor the ensilage, suffered a loss of protein, fat, or fiber, but that the total loss fell upon the class carbhydrates, which includes sugar, starch, &c., the least costly ingredients of fodder.

Admitting now that quite as much of the dry matter of green corn was preserved *in this experiment* by field-curing as by packing in a silo, there remain still several important questions to be considered. First, will cows eat the dried corn fodder as readily and with as little waste as they will eat ensilage? Second, how does the milk of cows which are fed dried fodder corn compare in quantity and quality with the milk of the same cows when ensilage is used?

A feeding trial was begun on the 6th day of December for the purpose of studying these questions. Four cows were selected from the herd, placed side by side, fed, watered, and exercised at the same time, and for sixty consecutive days treated in all respects as nearly alike as was possible.

During the first period of twenty days all four cows were fed the same daily ration, made up for each one thousand pounds of live weight, of

	Fat.	*Protein.*	*Carbhydrates.*
Twenty pounds dried fodder corn, containing . .	.10 ℔s.	.57 ℔s.	7.08 ℔s.
Three pounds winter wheat bran, containing . .	.10 ℔s.	.40 ℔s.	1.38 ℔s.
Thirty pounds brewers' gr's, containing	.40 ℔s.	1.58 ℔s.	3.00 ℔s.
Total digestible food, ...	.60 ℔s.	2.55 ℔s.	11.46 ℔s.

The digestibility of the dried corn is here assumed to be the same as green corn.

During the second period of twenty days the daily ration of two of the cows was the same as during the first period; the other two were fed on ensilage instead of dried fodder corn. For each one thousand pounds of live weight this second ration was

	Fat.	*Protein.*	*Carbhydrates.*
Fifty pounds ensilage, containing	.10 ℔s.	.64 ℔s.	7.34 ℔s.
Three pounds of winter wheat bran, containing	.10 ℔s.	.40 ℔s.	1.38 ℔s.
Thirty pounds brewers' gr's, containing	.40 ℔s.	1.58 ℔s.	3.00 ℔s.
Total digestible food, ...	.60 ℔s.	2.62 ℔s.	11.72 ℔s.

The digestibility of the ensilage is here assumed to be the same as green corn.

This ensilage ration was fed to all four cows during the third period of twenty days.

The dried fodder corn, as stated above, was cut and crushed in a machine which leaves it in such a condition that cows can eat it easily. After the first day or two in the first period, the dried corn ration was eaten without waste. During the second period, one of the cows seemed unable to eat all the harder pieces of ensilage. The amount wasted, however, was regarded as too small to be taken into account. *The facts, therefore, seem to show that dried fodder corn when cut and crushed is eaten quite as readily and with as little waste as ensilage.*

During the entire experiment the cows were milked twice daily, at four, A. M., and four, P. M. The milk of each cow was weighed separately, and its weight at once recorded.

Analyses of the milk were made on five consecutive days in each period. For this purpose, sample No. I represented the total daily yield of cows I and II, while sample No. II represented that of cows III and IV. Results obtained when the cows were fed ensilage are, for the sake of comparison, indicated by an asterisk *:

Cow number	*I.*	*II.*	*III.*	*IV.*
Calved, ...	Nov. 14, 1881.	Nov. 23, 1881.	Aug. 1, 1881.	Aug. 1, 1881.
Served, ...	Jan. 27, 1882.	Jan. 7, 1882.	Sept. 18, 1881.	Oct. 1, 1881.
Yield of milk:				
First period, ...	624 lbs.	540 lbs.	339 lbs.	350 lbs.
Second period, ...	624 lbs.	526 lbs.	*310 lbs.	*401 lbs.
Third period, ...	*579 lbs.	*500 lbs.	*300 lbs.	*386 lbs.
Total for sixty days,	1,827 lbs.	1,566 lbs.	979 lbs.	1,137 lbs.

In the following tables, cows I and II form herd No. I; cows III and IV, herd No. II. The analytical results given below are *averages*, drawn from the daily determinations of the milk of five consecutive days in each period:

HERD NO. I.

	Specific Gravity.	*Total Solids.*	*Butter.*	*Protein.*	*Sugar and Ash.*
First period, ...	10,340	13.55	4.27	3.31	5.87
Second period, ...	10,327	13.55	4.49	3.11	5.95
Third period, ...	*10,330	*13.87	*4.58	*3.20	*6.09

HERD NO. II.

	Specific Gravity.	*Total Solids.*	*Butter.*	*Protein.*	*Sugar and Ash.*
First period, ...	10,340	13.87	4.27	3.43	6.17
Second period, ...	*10,343	*14.01	*4.42	*3.41	*6.18
Third period, ...	*10,346	*14.51	*4.58	*3.59	*6.39

As cows advance in their periods of lactation, the per cent. of solid matter in their milk gradually increases; while the yield of milk, as is well known, decreases. A second table is, therefore, given, in which the absolute amounts of butter, protein, &c., yielded by each herd during each period are compared.

WEIGHT YIELDED.	TOTAL SOLIDS.		BUTTER.		PROTEIN.		SUGAR & ASH.	
	Herd.	Herd.	Herd.	Herd.	Herd.	Herd.	Herd.	Herd.
	I.	II.	I.	II.	I.	II.	I.	II.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
First period, . .	157.7	95.5	49.7	29.4	38.5	23.6	68 3	42.5
Second period, .	155.8	*103.8	51.6	*32.7	35.8	*25.2	68.4	*45.8
Third period, . .	*149.6	*99.5	*49.4	*31.0	*34.2	*24.6	*65.7	*43.8

A summary of the facts shown in the above experiment, is as follows:

First. When the green corn was dried in stacks the loss of food was less than it was when the corn was packed in a silo.

Second. When dried corn fodder was cut and crushed, it was eaten by cows, under experiment, quite as readily and with as little waste as ensilage.

Third. In three cases the yield of milk was not increased when ensilage was substituted for dried corn, but, in one case, ensilage caused an increase of eighty-seven pounds of milk in forty days.

Fourth. In the mixed milk for twenty days of herd No. I, ensilage caused no increase in the yield of total solid matter; while in the milk of herd No. II, for the same period, it caused a gain of eight and one third pounds, or seven per cent.

Prof. W. H. Jordan, of the Pennsylvania State College, and Agricultural Chemist of the Board, reports as follows:

The work undertaken on ensilage, the results of which are contained in the following, was entered upon not to show that corn fodder can be preserved in pits, nor to demonstrate that fodder thus treated is nutritious and readily eaten, for these facts are acknowledged. The principle object of the investigation was to ascertain the extent of the changes and loss which the fodder suffers from the fermentation. It was, of course, deemed desirable to obtain accurate data as to the cost and feeding value of the fermented materials, but circumstances were such as to prevent reliable results being reached in these directions. It is hoped that the work of another year can be made more comprehensive, so as to include all the factors involved in the question of profit.

Cultivation of the Crop.

The corn was planted the last week in May, on land producing a small crop of wheat the previous year. Manure was applied at the rate of about eight cords per acre. One bushel of seed was planted per acre, the variety being Southern White corn.

It was expected that the two acres of land planted would produce at least thirty tons of green fodder, but owing to the exceptionally severe drought, the crop was considerably less than half that amount. The corn received about the same cultivation as ordinary field corn.

Preservation of the Fodder by Ensilage.

In order to avoid the cost of an expensive silo, an old root celler was made to answer every purpose. This cellar was of masonry, cemented air-tight. As it was too large, a partition was thrown across midway, so that the silo was really built of masonry on three sides and of wood on the fourth.

The fodder was cut into pieces about three quarters of an inch long, by one of Hauck & Comstock's fodder cutters, smallest size, which was found to do efficient work, cutting the fodder at the rate of thirty tons per day. The chopped fodder was pushed through a trap-door in the barn floor into the silo below, where it was tramped down by mules. After being thoroughly tramped down, the compact mass was covered with a layer of straw about eight inches deep, then two layers of boards, and upon the boards was piled stone at the rate of half a ton to every square yard. The silo was filled during the second week in September, and was not opened until December.

Character and Appearance of the Ensilage.

When the silo was opened, it was found that at the surfaces and sides the fodder was blackened and somewhat decayed to the depth of a few inches.

The remaining portion of the very compact material was darker in color than when it was put in, had the characteristic odor and slightly acid taste noticed in all ensilage; but, on the whole, seemed to be nicely preserved. Nearly all of the animals to which it was offered ate it at once quite heartily.

The description of the practical details of constructing and filling the silo are made brief, because they are matters about which any intelligent, reading farmer need have no lack of reliable information; and, as before stated, it is not the *possibility* of ensilage that needs discussion.

Character and Extent of the Changes that Occur in the Fodder during Ensilage.

No one has attempted to dispute the fact that fermentation takes place in the silo, to a greater or less extent, according to the manner of filling, but which no amount of care can entirely prevent. Fermentation must result in certain changes in the composition of the fodder, which must affect the nutritive value of the material fermented. The character of these changes has been better understood than their extent.

While it has been well known that the alcoholic and lactic fermentations must go on largely at the expense of the carbo-hydrates, (sugar, starch, &c.,) there has been no very definite knowlege as to the quantity of these ingredients thus destroyed, or the accompanying changes experienced by other and more valuable compounds. With a view to obtaining more information on these points, the fodder that was packed in the silo was carefully weighed at the time it was cut, and several samples were also selected for analysis in such a manner as to render it quite certain that the average composition of the fodder at time of cutting would be correctly ascertained. The ensilage, as taken from the silo, was also carefully weighed and sampled. It should be stated that the sampling of the ensilage was such as to exclude those portions on the surface and sides of the silo that were much decayed, all the material that was taken for analysis being such as was in the ordinary state of preservation.

TABLE I.

	Green fodder.	*Ensilage.*
Total weight, ...	22,535 pounds.	19,116 pounds.
Water content, ...	71.58 per cent.	73.61 per cent.*
Weight of water-free substance, ...	6,404 pounds.	5,045 pounds.
Per cent. of water-free substance lost, .		21.22 per cent.

The quantity of water-free substance calculated for the ensilage is undoubtedly too small, owing to the method of sampling referred to above. The outer portions of the ensilage did not contain as much water probably as those portions taken for analysis, which would cause an error in the above method of estimating the water-free substance in the whole mass of material. A more accurate way of ascertaining the real loss from the well-preserved ensilage, is based upon the fact that one part of the fodder would not be affected in quantity at all by fermentation, viz: The ash or mineral substances.

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* Water and other volatile substances.

The organic substances only would be decomposed and pass off, so that one pound of ash would be found in less water-free substance in the ensilage than in the corn fodder before fermentation.

The next table gives the composition of the water-free substance in the two cases.

TABLE II.

	Green stalks.	*Ensilage.*
Ash,	5.04	5.51
Protein,	6.54	7.18
Crude fiber,	24.22	27.43
Other carbo-hydrates,	62.31	56.98
Ether extract,[*]	1.89	2.90

The preceding figures show that one hundred pounds of water-free substance in the fodder as taken from the field contained 5.04 pounds of mineral matters, while owing to a destruction of other material one hundred pounds of dry material in the ensilage contained 5.51 pounds of ash. By calculation we find that 91.47 pounds of water-free substance in the ensilage contain the same quantity of ash as one hundred pounds of water-free substance in the fodder before fermentation. In other words, *the green fodder lost in the silo 8.53 pounds out of every one hundred pounds of water-free substance put in, or a loss of 8.53 per cent. of dry substance.* As 6,404 pounds of dry substance were put into the silo, the total loss of water-free material would be 546 pounds. Practically the loss is more owing to the decay on the surface and sides, but the last estimate corresponds more nearly to what is correct than do the figures given in Table I.[†]

Now, upon what ingredients of the fodder does this loss fall? Knowing the percentage composition of the water-free substance in the two cases, we can calculate the amount of each class of ingredients in 100 pounds of dry substance in the corn as taken from the field, and in 91.47 pounds, as found in the ensilage, the latter being what remained of each 100 pounds put into the silo.

TABLE III.

	Green Stalks. *In 100 pounds of water-free substance.* Pounds.	*Ensilage.* *In 91.47 pounds of water-free substance.* Pounds.
Ash,	5.04	5.04
Protein,	6.54	6.57
Fiber,	24.22	25.09
Other carbo-hydrates,	62.31	52.12
Ether extract,	1.89	2.65[‡]
	100.00	91.47

A glance at the above table shows that *the loss has fallen entirely upon the carbo-hydrates,* about *sixteen (16) per cent. of this class of compounds having been used up during the process of fermentation.*[§]

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[*] Fat, chlorophyl, &c.

[†] Since beginning to write out the results given here, I have received the Second Annual Report of the New Jersey Experiment Station, also a bulletin giving results accordant with those presented here, only the investigation was much more comprehensive. It was found at the New Jersey Station that 100 pounds of dry substance lost in the silo 17¾ pounds.

[‡] The ether extracted nearly six per cent. of material from the ensilage, only about one half of which was found to be soluble in benzine, and the figures given in the tables for per cent. of fat in the ensilage, represent what was soluble in benzine. All the ether extract from the fodder before fermentation was found to be soluble in benzine.

[§] This result agrees with that arrived at by the New Jersey Experiment Station, viz That there was no loss of nitrogen, crude fiber, or fat from the fermentation in the silo.

The percentages of protein in the previous tables were obtained in the usual way, by multiplying the total nitrogen by the factor 6.25. Nothing is learned in this way as to the forms of the nitrogen compounds, either in the green fodder or in the ensilage. Determinations of albuminoid and non-albuminoid nitrogen by Stutzer's method, (see methods of analysis,) gave the following results for water-free substance:

	Green stalks.	Ensilage.
Total nitrogen, ...	1.047 per cent.	1.149 per cent.
Albuminoid nitrogen, ...	.914 per cent.	.567 per cent.
"Amide" nitrogen, ...	.133 per cent.	.582 per cent.
Per cent. of total nitrogen in the non-albuminoid form, ...	12.70	50.66

The above figures are the averages of closely accordant parallel determinations. While no conclusions should be drawn from them, they indicate that there may possibly be a breaking up of albuminoid compounds, at the same time that there is no actual loss of nitrogen. If such be the case, the nutritive value of the fodder would probably be affected.

There follows a table showing the composition of the green corn stalks, and the same after undergoing changes in the silo:

	Water.	Ash.	Protein.	Crude fiber.	Other carbo-hydrates.	Fats. Ether extract.
Green stalks, ...	71.58	1.43	1.86	6.88	17.71	0.54
Ensilage, ...	73.61	1.45	1.90	7.24	15.03	0.77

Results of Feeding the Ensilage.

All the ensilage was fed to a herd of milch cows. Owing to utter lack of time, no accurate data were obtained as to the results. It can be said, however, that no marked benefit could be noted by any ordinary method of observation. Previous to being fed on ensilage, the cows had been eating all the dried corn-fodder (stover) they would consume in connection with corn-meal and wheat-bran. The amount of meal and bran fed was not changed, and all the ensilage was given that the animals would take; but in passing from one ration to the other there appeared to be no change either way in the amount of milk produced. As the milk was sold daily by the quart, any marked decrease or increase would have been noted, especially as attention was directed to the matter. Neither is there any good reason for thinking that the milk improved in quality because of the ensilage. It is expected that more accurate observations will be made next winter on the comparative value of corn-fodder dried in the field and the same preserved in the silo.

General Remarks.

One thing is certain, viz: Nothing came out of the silo that was of value, that did not go in, in an equally valuable form. It is quite absurd, with our present state of knowledge, to claim that green corn-fodder increases in value by being allowed to lie in a large mass and undergo a partial decomposition. It may be safely affirmed that to the extent to which such decomposition goes on with any cattle food, to that extent is its capacity decreased for running or building up the animal machine. Careful investigation has also shown that fermented fodder has not an increased digestibility over unfermented; neither is there much reason why we should expect such a result. The experience of many years shows that ensilage is not a necessity for securing the healthfulness or vigor of animals, for a variety of food can be obtained more cheaply in other ways. Then why all this excitement over silos, and why call an "ensilage congress" any more than a "cotton seed meal" congress? Certainly the farmer who preserves grass in silos, and so handles three tons of water several times in order to feed his cattle one ton of dry substance, has lost his judgment, for grass can be cured to perfection by the old-fashioned method.

And as for preserving green corn-fodder, the only peg the ensilage enthusiast has to hold to, is his ability to show that by the use of the silo greater nutritive value is secured than by drying and stacking the fodder. In the careful investigation made at the New Jersey Experiment Station, the results did not differ materially with the two methods, save that the expense must have been greater in the case of the ensilage.

The above is not meant as a general condemnation of ensilage, as it may have its advantages for a certain class of farmers, but there seem to be no good reasons why farmers should get excited over it, or expect from it any remarkable results.

Scientific Evidence.

Under date of December 12, 1881, Prof. J. B. Lawes, of Rothamsted, England, writes:

"Ensilage has met with no favor in Great Britain. This is, I think, more due to the general growth of roots, which furnish abundance of food for the wintering of stock, than to any distinct investigations into the merits or demerits of the process.

"Near London, brewers' grains are sometimes placed in silos during the summer months, when the supply is much greater than the demand, and they will pay for storing. But these grains have already gone through the process of fermentation, and have lost the greater portion of their starch and sugar.

"The same may be said of the pulp of the sugar beet. Here again most of the sugar has been abstracted, and it must further be borne in mind that both these substances are the refuse of some manufacturing process, which must be disposed of, and, if worthless, be either given or thrown away.

"To make a silo of succulent vegetation, abounding in sugar and other valuable elements of food—with the certainty that a very considerable amount will be destroyed—can only be advocated on very different grounds.

"We know that corn, in the more succulent stages of its growth, contains a considerable amount of sugar—so much, indeed, that its manufacture has been suggested as an article of commerce.

"I have myself never seen the products of a corn silo, but when I read of alcohol and acids as forming part of them, it is not difficult to conclude that the source of these is the sugar of the corn, and probably very little of this will be found remaining.

"A farmer who places his corn in a silo, should clearly understand that in doing so he destroys a considerable amount of the food which the corn contained when introduced.

"With regard to the value of the process to a farmer in the States, I cannot pretend to form an opinion. The value of food may be so great at one period of the year, as compared with another, that the loss attending the operation may possibly yet result in a gain.

"Corn is grown so cheaply in the States, that a loss of food, which would be considered ruinous in England, might be there disregarded.

"The advocates of the system say, that although a good deal of the food of the corn is destroyed, some of the woody matter, which in its natural state would be indigestible, is, during fermentation, converted into food. It is quite probable that such may be the case. Experiments are still wanting to show what is the real loss which takes place. In order to arrive at any just conclusion, forty or fifty tons of corn should be weighed into and out of the silo, and samples of the corn, as it goes in and comes out, should be submitted to careful analyses.

"When the results were known, it is possible that the exaggerated opinions which appear to prevail in some places with regard to the value of this process, might be reduced to a more rational level."

Under date of December 6, 1881, the same authority writes:

"It is stated by a writer on the subject of ensilage, that grass contains a greater amount of nutrition when in blossom, than any time before or afterwards, and that what is true of grass, is also true of grain.

"While I am quite prepared to accept the fact as regards grass, I do not think it follows as a *necessary* consequence that the same is true as regards the ordinary grain crops, and at all events the subject is worthy of a few minutes' consideration.

"The main function in the life of a plant, is to provide seed for its reproduction. The seeds of most of the grasses are exceedingly light, and form but a very small portion of the weight of the whole plant. At the time of blooming, therefore, all the sugar and starch required to perfect the seed is already stored up in the stem and leaves, and the crop, if allowed to ripen its seed, will produce woody matter instead of more starch and sugar.

"In the cereal grains, the seed bears a considerable proportion to the whole crop. In some the seed and straw are of the same weight. In others, as, for example, in wheat, the proportion may be sixty or seventy pounds of grain to one hundred pounds of straw, and in all cases the seed forms an important item in the whole weight of the plant.

"I think there is evidence also to show that a considerable portion of the starch found in the seed, is not to be found in the leaves and stem at the time when the plant is in full bloom.

"At Rothamsted, in 1847, we selected a very level acre of wheat, which was divided into five portions, and cut at five separate periods, commencing with the 21st of June, when the plant was in bloom, and ending when the wheat was ripe. During this period the dry weight of the crop had doubled itself.

"Prof. Anderson also carried on some experiments. He did not, however, destroy a whole crop of wheat for the purpose, as we had done at Rothamsted, but operated upon a certain number of carefully selected specimens. Between the time of blooming and maturity, he estimated the increase of dry matter per acre at 2,000 pounds.

"A very large addition is therefore made to the solid matter of the crop, in the interim between the two periods. The sugar in the stem is converted into starch, more woody matter is formed in the stem, and it would appear quite certain that a considerable proportion of the starch, which is deposited in the seed, did not exist in the stem in any form at the time of blooming. We have no means of knowing how much was stored up in the roots, and how much was derived from the atmosphere. It would, therefore, be a mistake to say that at the time of blooming a corn crop contains as much nutritious matter as when it is ripe."

"In the former stage the nutritious matter is more soluble, and more equally diffused, throughout the whole of the plant, but the total amount is less than when the corn is ripe. In Mr. Bailey's book on Ensilage, he gives the chemical composition of the corn plant in the milk, and of the same corn as ensilage. Calculated upon the dry matter, the corn in the former state contained five and one half per cent. of mineral matter, while the dry matter of the silo corn contained more than nine per cent.; this, if correct, would indicate that about forty per cent. of the dry organic matter of the corn had been lost by fermentation.

"At Rothamsted, I have about fifty-four cows in milk, and about thirty head of young stock. Their main supply of food until next May, will consist of mangels. More than half of the whole dry matter of these mangels consist of sugar, and this sugar is the most valuable of all the ingredients which they contain. Now, if I were to subject these mangels to fermentation in a pit until the sugar was converted into alcohol and carbonic acid, I should be destroying that valuable element of food, which I had been at so much cost to obtain.

"In the clamps where our mangels are stored, their quality improves rather than the contrary, and a farmer would give a preference to roots which had been stored up for six months. If succulent food for winter is so valuable in the States, some comparison should be instituted between the relative advantages of corn and mangels.

"As regards ensilage, I must confess that I do not altogether like a process which appears to be so destructive of food."

One of our correspondents wishing to know what acids were developed during the fermentation in the silo, the question was reported to Prof. Genth, of the University of Pennsylvania, and analytical chemist of the Board, and Prof. Jordan, of Pennsylvania State College, and agricultural chemist of the Board.

Prof. W. H. Jordan, agricultural chemist of the Board, writes as follows:

"When fresh material is taken from the silo, or after having been exposed to the air for a short time, it is found to be perceptibly acid to the taste. Whatever free acid is present, is the result of some kind of fermentation. When any material of a vegetable character has become sour, either in a silo or outside, we should expect the acidity to be due to one of three acids: acetic, lactic, or butyric, or a mixture of two or all of these. If acetic acid, then *alcoholic* or *vinous* fermentation must have taken place, the alcohol being subsequently changed by oxidition to acetic acid. Lactic acid would be the result of *lactic* fermentation, and butyric acid might afterwards be produced by the decomposition of the lactic acid."

Green crops that are put in silos contain all the compounds that are necessary for the support of either *vinous* or *lactic* fermentation, though it seems as if the former would most naturally occur. Of course, a determination of the kind of acid or acids found in the sour fodder would indicate the nature of the fermentation that had taken place. I do not know that any examinations of ensilage have been made in this country with a view to determining the kind of acid present. If there are records of such, I have not access to them. I find, however, that the matter has been studied somewhat in Germany. Nearly all such analyses have been made from what the Germans call "sauer futter," (sour fodder,) which is material fermented to a greater extent than is the case in the modern silo.

J. König,* of the experiment station at Munster, found .732 per cent. of free acetic acid in sour fodder, consisting of grass, beet, and carrot leaves. Such fodder would contain nearly fifteen pounds of free acetic acid per ton.

Grandean & Barral† found from .22 per cent. to .41 per cent. of acid in a mixture of maize, rye, straw, and chaff, which was packed in a cemented pit with vertical sides. The kind of acid was not stated.

At the experiment station at Kuschen,‡ sour fodder that was examined contained from .21 per cent. to .29 per cent. of free acetic acid; the kind of fodder not being stated.

In fermented beet pulp, there formed .32 per cent. of acetic, and .16 per cent. of lactic acid.§

Beet leaves fermented in a pit were found by Dr. Kellner‖ to contain at the opening of the pit 0.67 per cent. of free volatile acid, (reckoned as acetic,) and 2.99 per cent. of non-volatile acid, (reckoned as lactic.)

An examination, by E. Weldt,¶ of green maize fodder reserved in the most modern silo, showed the presence of .63 per cent. of free volatile acid and 1.03 per cent of free non-volatile acid. In the latter case, as in the one preceding, the volatile acid was considered to be acetic, the only other volatile acid at all likely to be present, being butyric. It was also safe to assume that no other non-volatile acid than lactic would be produced by fermentation.

I made, yesterday, a partial examination of a sample of fresh ensilage just as taken from the silo, and in good condition, and I found unmistakable evidences of the presence of acetic acid. That this acid is formed even during the changes that take place in the silo, we have no reason to doubt. The extent of the alcoholic and subsequent acetic fermentation must, of course, depend upon the amount of oxygen accessible. It is not possible to secure the entire expulsion of the oxygen from the mass of material in the silo, no matter how finely it is cut or how compactly it is pressed, and it is certainly to be expected, that what oxygen is available, should be used up in sustaining fermentation. It is merely a question of producing less alcohol and acetic acid than would be the case with some less perfect method of preservation.

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* Jahresbericht für Agr. Chemie, XIII, s. 32.

† Jahresbericht für Agr. Chemie, XVIII, s. 31.

‡ Jahresbericht für Agr. Chemie, XVI, s. 35.

§ Jahresbericht für Agr. Chemie, XVI, s. 34.

‖ Biederman's Central blatt für Agr. Chemie, IX, s. 724.

¶ Biederman's Central blatt für Agr. Chemie, X, s. 642.

But with your correspondent it is a question of the effect of acetic acid in the fodder upon the keeping qualities of the butter. It would be nothing to occasion surprise if it were found that the milk of cows eating ensilage proves unfit for use by infants and invalids, but there does not seem to be any good reason at present for believing that the keeping qualities of butter from such milk would be inferior to the keeping qualities of butter produced by any other method of feeding. It does not seem probable that ensilage would communicate to the fat of milk any tendency to early decay.

Prof. F. A. Genth, analytical chemist of the Board, after an analysis of the samples furnished at the request of the Secretary, reports as follows:

During the latter years the method of preserving green food in silos has become of considerable importance to our farmers, and many have been the injuries, as to its value, and the favorable or deliterious influences which ensilage has in feeding cattle upon the production of milk and butter.

At a meeting of the Massachusetts Board of Agriculture, held at South borough, this question was very ably presented by Doctor C. A. Goessmann, of Amherst, and the experiences of various members communicated and discussed. The records of this meeting are contained in the twenty-eighth annual report of the Secretary of the State Board, from which document I may be permitted to give a brief outline of the facts stated, and the conclusions arrived at, together with experiments with reference to the acid constituents of corn ensilage which I have made.

Either juicy plants or parts of plants are placed as tightly as possible into dry ditches or cemented cisterns, especially constructed for that purpose, and packed and thoroughly trampled down to exclude all the air as much as it is possible. Some add a small quantity of salt. After the pit has been filled it is covered with at least two feet of earth, usually without a separating layer of straw or boards.

The contents of the silo soon undergoes fermentation which continues for one or two weeks, at the end of which it is ready for use and can be kept for six to ten months or longer.

The resulting ensilage has either an acid character, or it is indifferent, or even slightly alkaline—and compared with the original fodder plant has sustained a great loss in weight, amounting frequently to from 40 to 50%.

This loss, especially in juicy plants, is largely water, but also the non-nitrogenous organic matter suffers a great loss by the fermentation of the amylaceous and saccharine constituents of the plants, by their oxydation into alcohol, carbonic, acetic, and other fatty acids, lactic acid, &c.

Very little nitrogen is destroyed in the form of ammonia and similar compounds, and it relatively increases in the ensilage. Numerous experiments have been made, especially in Europe, to determine the loss in feeding value by the conversion of fodder plants into ensilage, from which a few have been selected. In several experiments with green clover it was found that in one the green clover contained 4.55% of nitrogenous matter which in the ensilage was increased to 4.62, the fatty substances from 1.19% to 2.03%, whilst the non-nitrogenous matter amounted to 9.20% in the clover while the ensilage contained only 5.98%. In another experiment the nitrogenous matter increased from 20.04 to 22.14%, the fats, &c., from 5.26 to 9.76%, and the non-nitrogenous matter was reduced from 40.53 to 28.66%. The total loss has not been given, but a similar fodder plant "esparsette" (cultivated saint foin) lost 24% of the organic dry matter which was destroyed in the fermention. The composition of the dry plant, compared with the ensilage made from it, showed an increase for nitrogenous matter from 18.56 to 20.44%, of fats, &c., from 2.89 to 6.02% and a decrease of non-nitrogenous matter from 38.60 to 30.88%.

In experiments made with green corn fodder it was found that the effect of silo-fermentation was a considerable loss of valuable organic constituents, differing at the depth of the silo. At a depth of fifteen inches—27.9% of the organic matter of the green corn fodder had been lost, and at a depth of thirty inches—34.7%. In a second experiment at a depth between thirty-seven and thirty-eight inches, 34.8% had been lost. The ensilage contained a variable amount of alcoholic products and considerable quantities of fatty acids.

An experiment which appears to be of considerable importance has been made with raw wheat straw, in which, when fermented in a silo, the soluble and digestible matter was increased from 23.66 to 45.90%, the nitrogenous matter from 2.93 to 4.19%, whilst the raw fiber showed a reduction from 54.13 to 34.54%.

These few experiments which I have quoted will give a pretty correct idea of the working of the silo system, and the gains and losses which are the result of the conversion of green fodder into sour fodder, or ensilage. The recommendation of corn ensilage cannot be based upon its higher feeding value, pound for pound, when compared with green corn-fodder. The increased digestibility and the slight increase in nitrogenous matter is a doubtful compensation for the loss of starch and sugar destroyed by fermentation.

The silo system is no exception of the rule in preserving fodder, which is always accompanied by a loss in quantity and quality of valuable constituents of the plants, and that the higher feeding quality is invariably secured at the sacrifice of quantity. One of the great advantages of the silo system is, that it is independent of the weather, and the fodder plants can be put in the silo during rain without disadvantage.

The mode of converting fodder plant into hay causes, frequently, losses which outweigh those, sustained by their conversion into ensilage. The mere drying does not effect any loss in their feeding value, but many, like clover, with coarse juicy stems and tender leaves, suffer seriously from the loss of leaves by handling, whilst at the same time a less digestible food is produced. It has been found that even the most carefully prepared clover hay shows a loss of from 2 to 6% in their several proximate constituents.

A still more serious loss is sustained in the feeding value of fodder plants, if, during hay making, they are exposed to rain even for a short period, which alters their quality in a far higher degree than generally believed. Some very interesting experiments have been made with reference to the loss sustained in this manner, which I will insert.

Clover hay was reduced by exposure to rain for two weeks in nitrogenous matter from 11.22 to 8.15%, in fat, &c., from 2.40 to 1.61%, and in non-nitrogenous matter from 35.33 to 29.51%, or in toto of nutritive matter from 48.95 to 39.37%, or over 19.5%. In another case, clover hay exposed for two weeks of rainy days lost over 49%, being reduced from 53.15 to 27.09% of nutritive constituents.

Good Lucerne hay lost through some occasional rain showers within two days 7.13% of its dry matter, which would probably be about 15% of the whole, and in another case it had suffered repeatedly from rains within six days, and lost 16.7% of its dry matter, or about one third of its value.

As the silo system is entirely independent of the weather, as it avoids, therefore, losses which would be produced by an unfavorable season; as it also avoids losses of valuable, in fact the most valuable, parts of plants by handling; and as it increases largely the digestibility of fodder plants by changing indigestible constituents, like cellulose, into soluble ones; and as many parts of plants or other vegetable offal which otherwise would be wasted, can be saved and converted into a palatable food; and as ensilage is more acceptable to live stock than dry fodder, the silo system will certainly prove to be a most valuable assistant to secure a larger quantity of good fodder, and of saving fodder which otherwise would be lost.

A very important question was raised as to the effect of feeding ensilage upon the production of milk, &c., but no one of those who have used it have observed that it is in anyway injurious.

As the ensilage frequently contains a considerable quantity of acid, it probably would be injurious to feed exclusively ensilage in large quantities. It is, therefore, recommended to supplement it with hay, or even stronger articles of fodder, from time to time.

It has been suggested that the fermentation of the fodder in the silo would produce lactic acid, together with alcoholic products and fatty acids, &c., but in an analysis of maize ensilage, made at the Connecticut agricultural experiment station, (see report for 1881, page 89,) it is stated that the nitrogen free extract "*contained free acid, 0.66% reckoned as ascetic acid*," no mention is made of lactic acid.

I have not been able in the literature at my command to find any actual experiments which have been made to ascertain the nature of these acids. I have, therefore, at the suggestion of the Secretary of the Pennsylvania State Board of Agriculture, made an examination of a sample of corn ensilage, kindly furnished by Messrs. John Barnard & Son, at Doe Run, Chester county, Pennsylvania.

The ensilage consisted of the leaves and some stems of Indian corn; also, some of the grain and husk. The leaves had a healthy appearance, and a grayish green color. The liquid which was squeezed out had a slightly alcoholic odor, a decidedly acid reaction, and contained a considerable quantity of starch suspended in the same.

After the starch and other insoluble matter had settled, the clear liquid was distilled until no more acid vapors passed over. The distillate contained some alcohol, but too small a quantity for determination. It was evaporated over the water-bath with calcium carbonate. The resulting lime-salt was dissolved in water, and again evaporated. It gave all the reaction of calcium acetate, but seems to have contained a small quantity of calcium formate, as it readily reduced a solution of silver nitrate. The analysis of the lime-salt showed that it was not quite pure, as it contained only 32.76 % of lime, instead of 35.44, which is the percentage of the pure salt. The quantity at my disposal was too small for a further purification.

The liquid from which the alcohol and volatile acids were distilled off was neutralized with oxide of zinc, and the zinc-salt evaporated to crystallization. The salt was obtained in fine, white, needle-shaped crystals, frequently radiating from a center, and in small tufts. By re-crystallization it was purified, and gave all the reactions of zinc lactate.

The analysis of the crystallized salt gave 18.44 % of water, and 26.79 % of zinc oxide, which corresponds closely to the composition of zinc lactate, which, in its pure state, contains 18.18 % of water, and 27.27 % of zinc oxide.

It is established by these experiments that the acetic and lactic acids are the principal acid constituents of corn ensilage, and, if I take the quantities of calcium acetate and zinc lactate obtained as a basis, they are present approximately in the proportion of twenty-five acetic acid for forty-one of lactic acids.

There are other acids present in smaller quantities, but the amounts at my disposal were insufficient for further experiments. A few tests, however, which I have made prove the absence of oxalic acid, and the probable presence of citric acid.

HYGIENE IN THE HOUSEHOLD.

By Dr. H. LEFFMANN, *Microscopist of the Board.*

(Extracted from an address at the spring meeting, 1882.)

MR. PRESIDENT AND GENTLEMEN OF THE BOARD OF AGRICULTURE: The subject of hygiene is an important one, and it is one in great part of modern development. The science as now taught by the leading medical men is not simply that "an ounce of prevention is worth a pound of cure," which was the former method. Our more modern method is to enable every farmer and citizen to know the cause of disease, which is more valuable than the treatment of it. Therce, in accordance therewith, I will call your attention to some of the laws of health as they are known to us, though not exclusively, and which may be of value in retaining health and lengthening life; not to present an array of individual experiences, on the effect of climate; but simply honest convictions. It was Galileo, an ancient writer, who said the conditions of health are dependent upon three things: the air, the water, and the place. We must modify somewhat this division of subjects, because we must include all the things that effect health in food; not only that which is taken into the system by eating and drinking, but the form. Therefore we make slight variations, by saying: the air, the food, the water, and the place. Upon the first it is possible to say considerable about. We are taking into our system a certain quantity of air, or into our lungs, and quantities are absorbed or seized or taken in various ways, according to the size of the individual, and other various circumstances. It is required that this air shall have a certain composition. It cannot vary much from these points without serious injury. Now the variations to which it is subjected are quite numerous. Every respiration takes from it one fifth of its ingredients, so that of the bulk with every respiration the air loses much of its oxygen. In other words, with every breath of one hundred parts, twenty parts or a little more of it are lost. In a large room with one person the air is therefore slightly changed from this cause; but in a small room by re-breathing this air, with so much of the oxygen exhausted, there will be more or less burning of the tissues. Whether this takes place in some of the lungs, or the change is transferred by the lungs, we are not prepared to say; but we know that a substance is left somewhat similar to coal burning in the stove, or by ordinary illuminating agents. The process is one of combustion. This acts more or less directly on the person, and is believed to be an important part of the injurious character of foul air.

There is around us, in the air, a quantity of water which has an injurious character, and certain small quantities of broken down animal tissue—the same structures to which the lecturer of last evening (Prof. Thomas Meehan) called your attention in reference to plant life; the larger part of the lungs or tissues of the body are broken down under these changes and variations in the atmosphere. As far as we know, or we think we know, this organic matter, as it is called—these particles which are taken into the air, if these are again breathed, they will remain largely in the animal that takes them in, especially the human animal. It would appear that some of the lower animals have higher resisting powers against these conditions than those of a higher order. It is apparent from long observation that the moisture which is in the air exercises several important influences as regards healthfulness. In the first place the germs of nutrition in this organic matter are great; and a checking results in a feeling of discomfort. It also interferes with the generating of heat in the body, and from the moist air we may afterwards feel chilly, because it is being taken into the skin rapidly. The absorbing power has a very chilling effect from the air, as I have described; and the repairs the body is trying to make in striving to retain its healthfulness, result in our having that unfavorable condition of health. It is consequently necessary to have the air removed away from us after it has been breathed; and a great many of our public halls and also our houses are supposed to be arranged with this view. If I were to suggest anything in regard to these public places as ordinarily built, it would be in favor of abolishing all the present systems. In houses, we have practically no ventilation in our domestic arrangements, except that which the carelessness of the mechanic gives; the windows or doors do not fit as well as the architect intended them to, and we thus get a good deal of air in that way. But we do this when we interfere with the architect's intentions. With a house built as usually planned, the result is such that when we enter a room it is oppressive; we have to become accustomed to the place. This is owing to the improper state of the atmosphere.

It is also a mistaken notion, which I wish to get rid of, that the thermometer is a guide to the healthfulness of air. A great many believe if air is cold it is pure, and they act on that belief. Such a doctrine is a very incorrect one. Cold air may be totally unfit to breathe, and warm air may be made entirely fit. I have found that the natural movements of the air is not only prevented often by arranging for its escape from the building, but the arrangement interferes sometimes with any escape that we would otherwise have. For instance, in regard to airing a room by opening windows. Some persons do not sleep without open windows. It is the usual custom to open the windows from the top, all modern houses being constructed in that way. The rule of nature is that warm air rises, the parts being slightly increased in bulk by the rising of the temperature. Foul air and cold air descend. You will find in all our public places and in many houses contrivances to open from above, and many of the so-called ventilators of our halls are arranged in the same way, while there is nothing really to carry off this foul air in lieu of the lower temperature, or cold air falling to the surface of the floor. Not unfrequently the air outside on the walls and windows rapidly cools the inner surface. That I call the radiating power. That uses the heat a little more rapidly than it is taken up, and in that way we lose a few degrees in temperature of the inside air. The warm air instead of going out of the openings falls to the ground by this cooling process at the sides again circulates through the room, and, of course, is unhealthy. It is in that way these arrangements are apt to fail. It is also necessary that the widow should not only be open, but pretty widely open, I think, at the top and bottom. In cold weather people do not put the windows up from the bottom, because they fear they will catch cold. The reason is that they accustom themselves to such closeness of air that they cannot bear the shock. They go on with what they believe to be a protection, but which is certainly unhealthy, and when they are exposed without protection to the action, a large number of diseases of a chronic character result to the lungs and organs of that portion of the body supposed to be affected by the inhalation of foul airs. These things are often wrongly stated in newspapers and by public lecturers.

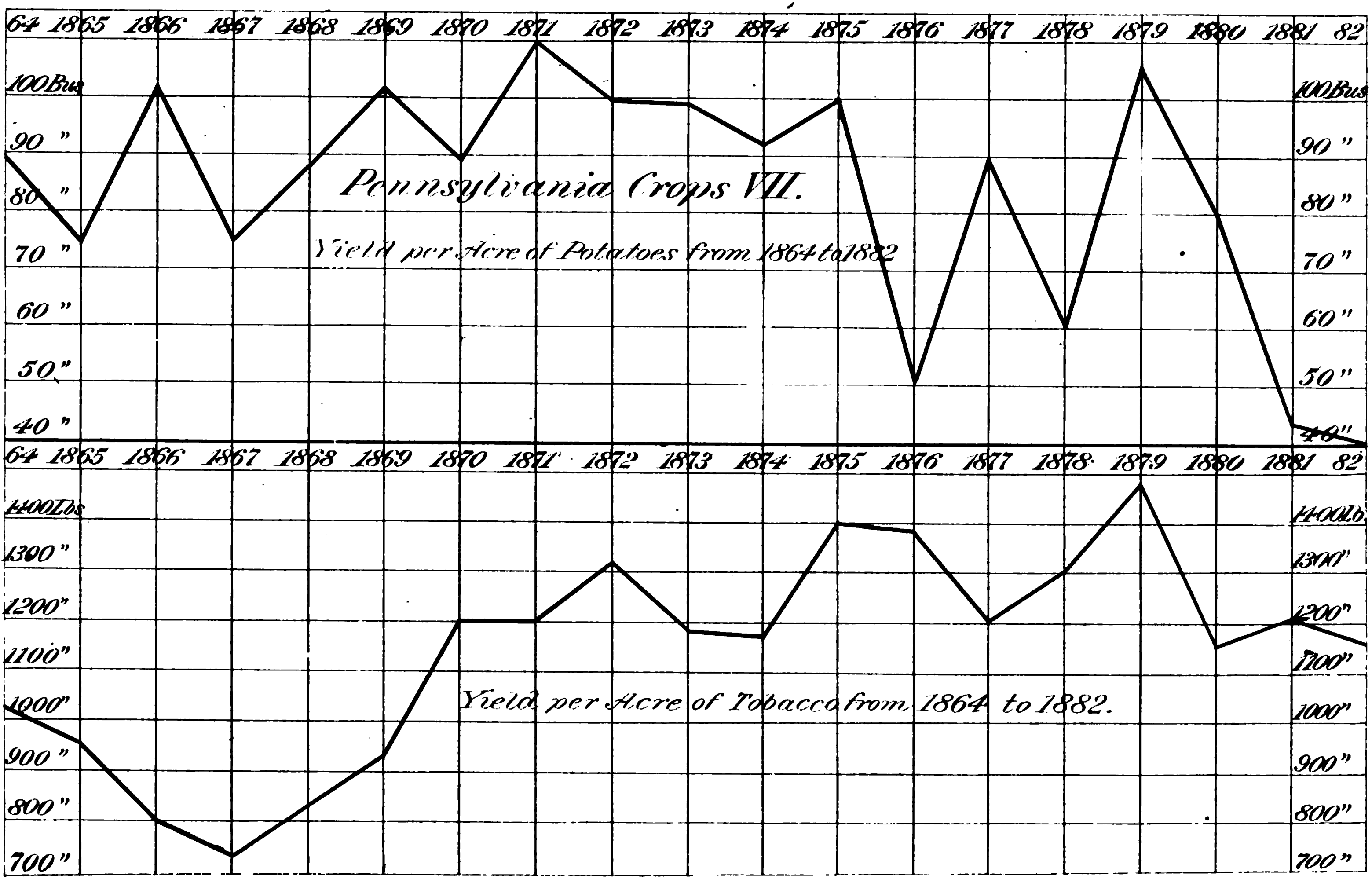
In regard to the question of our windows. I think it is one that ought to be strongly impressed upon every one—that every one should become accustomed to sleeping with open windows. I am satisfied that a reasonable amount of attention to this matter will produce a consistent view—consistent not only with peculiar conditions, but any ordinary conditions, and the prevention of what are called common colds. My own experience leads me to especially recommend this to those who are accustomed to cold in severe winter weather. Such people generally have more or less cough, sore throat, and slight abnormal condition of the lungs, or more serious affections; and all these break down the health. With regard to air, the important point is to let the bad air get out, and you can only do this by openings. In halls like this, it is my opinion that the ventilators do no good whatever: they may as well not be there. The air or weather outside being slightly cooler than the temperature within, the carbonic air rises and strikes these cold walls and windows, drops, is again breathed, and most likely breathed over and over two or three times in the evening with the other air in the room. It is our practical experience that in large buildings this can only be reached by better mechanical appliances; and the new improvements of air currents in closed buildings, even when the attempt is made to keep them in operation, is not sufficient to renew air enough to make them healthful. It is the experience of surgeons in the late war that cases of fever, especially typhoid fever, recovered in much larger proportion in open field, or under rude structures of boards, than in the ventilated, furnished, and fitted hospitals in the centers of the cities. There is no reasonable doubt that it was due to the freshness of the air which we do not get in our town institutions.

Water is of great importance in regard to health, and water often results in much sickness. But before coming to that, the effect of unhealthy fresh air only is to be learned from study of the causes of death in our arge cities, or where it is directly traceable to re-breathing air.

With regard to air in the house, I think we should keep it in as good condition as possible. I think we should remember that the windows do not alone give that which is necessary to our wants. We should oppose the placing on of weather strips and articles of that kind, intended to interfere with air currents.

As to cleanliness, the sentiment we might urge is this: Air once breathed is as foul as dirty water, until washed or purified. No person will use water after having been used by another, especially when dirtied, but they will breathe the air used by another person, and pay the debt for it. The mere question of cleanliness should, I think, actuate us in this matter. While the temperature of the summer season is such that we are always obliged to have free ventilation in order that we may get the benefit of pure air, it is in the colder season we have the enforced ventilation, because the ordinary conditions in which we are placed in summer time do not then occur. If the room is cold, it should be made comfortable by the use of a fire; but as long as possible the free air should come through it.

With regard to the moisture of air, some interesting questions have come to light by the aid of chemistry. A closing of the surface of the skin may come from the introduction of heat as well as from cold, and perspiration does not take place alone from the effects of heat. Persons say that in the winter season they do not perspire. That is not strictly true. The skin is continually throwing out moisture, and often a pleasant cooling influence is produced, and no amount of discomfort is felt. The discomfort is felt when the moisture remains. If we leave a room, heated by the ordinary system of hot-air furnaces, a dry heat having been thrown into the room, we may have an unfavorable condition in this way: the drier the air is the more the evaporation. It is proper, therefore, to have moisture to prevent too rapid evaporation. We have such a dry air supply often in city residences. The skin is kept drained of its moisture, or more rapidly than natural, and we feel a little chilly from this cause. The temperature has to be raised to counteract this coldness, because of the dryness of the atmosphere. If moisture were let in, we would soon find that we could get along quite as comfortably with a cooler temperature. In connection with proper furnaces, water pans are provided, into which water is placed to supply the air with this proper moisture; but it is my experience that the hottest place in the world is at the water pan, and that it is most generally a dry pan. Though at first it works well, it gets out of order; but the plumber is not called in because plumbers' bills are generally high. If the water pan remains in good condition, and it is left to the public to fill, (as is generally



Pennsylvania Crops VII.

Yield per Acre of Potatoes from 1864 to 1882

Yield per Acre of Tobacco from 1864 to 1882.

For yield of potato crop, 1882, Plate VII, for 40, read 80.

may some times be drawn into it, and at other times not. The arrangement is not carried out, and, accordingly, we find the most unhealthy conditions in many of our modern buildings, consequent upon the dry, heated air. Therefore, these places have to be avoided entirely, or the temperature kept high, that these chilling influences may be prevented. So much then on the point in regard to the question of air.

An important question is that of food, in which I would include water. The water supply has engaged the attention of chemists of late years, and English chemists have made the greatest progress. We are obliged to go to them for substantial information on the subject. It is their view that the water that contains least mineral is the most wholesome. Distilled water can be used, and the person remain healthy. This is proved by tests at stations where the water naturally is not fit to drink, but is prepared for that purpose by distillation. The crew of a ship can be kept a long while on such water, provided it is aerated. Notwithstanding the absence of mineral in some water, it has appeared to be injurious; but compared with the water used in some cities with mineral in, it is not very injurious. On the subject of hard water, it seems to me the death rate is lower where hard water is most marked; but it is not considered safe to rely on this largely. The old view of medical men that water impregnated with mineral is necessarily hurtful, seems to be exploded. But it is conceded that water should not contain anything decayed of vegetable or mineral matter. Many waters may be rich with organic matter, and yet not injurious. Waters in the fall of the year are changed in their elements by the water that falls into them. I have seen water from parts of Pennsylvania filled with leaves and much organic matter, yet not injurious, but at the same time like tea with the solution of the leafy matter. It appears to us that it is only when the organic matter is in a state of decay that it is capable of injuring the animal system. It is unfortunate that we cannot determine this to perfection at the present time, for water analysis has not reached its perfect state. It is impossible to determine upon the water supply, unless the water be very good or bad. There are a large number of waters that cannot be perfectly analyzed or determined upon, unless contaminated as I have said. I have been engaged for some time in examining the waters of cities of this State and adjoining States, and I have found that pretty generally they are made up of good materials. The water supplies of London are standards of comparison, because they have been very carefully examined. It is satisfactory to know that most of our water supplies, as for New York, Philadelphia, and Baltimore, compare favorably with foreign standards. Thus Philadelphia has good water, though those not living there and unaccustomed to it, compare it unfavorably with water they are accustomed to. I notice one point in which a great many people are at fault. They value water by the character of its taste—it may be flat and disagreeable compared with waters they are accustomed to in springs. A great many strangers go to Philadelphia and find fault with the water, but it is water very nearly natural; there is very little mineral or organic matter in it. It is a sort of exhausted water, which, after undergoing a great many struggles, comes to us nearly pure. It does not seem to contain anything to create disease. The taste of the water is not good, and it has the appearance of containing foreign matter. Water may be very bright and clear, and sparkling and pleasant, and do considerable harm. It may have a turbid, disagreeable look, and yet contain nothing injurious to us at all. I will now leave the question of water, and take up the question of food.

We take into our systems daily, considerable quantities of solid food from the vegetable kingdom and mineral kingdom. Experiments made in regard to this subject, have, of late years, shown that we may get along with much less food than we are now in the habit of taking. It is the opinion of some prominent men and physicians, that sleep is a lazy habit we have gotten into, and that eating is a gluttonous habit; that eating three meals a day is more than we require, and that we could get along with one meal a day, which would be a matter of convenience. Whether this will be brought about, I do not know; but no doubt a large amount of ill health comes from irregularity of diet, and the character of the food which we eat. Not only is it in reference to the character of the various kinds of food, but also in the preparation of it. The art of cooking is in a very unsatisfactory condition in this part of the country, at least. We often have food not properly prepared for us, and there is a failure in the digestion. Sometimes there is either too much of it, or the stomach is not able to consume it, and we are troubled with the irritation which the food occasions, and other disturbances. It will be a great advance when the art of cooking reaches such a point, that the food will come to us in a properly prepared state. In this connection I will say something in reference to the amount of cooking, especially with reference to meats. A great many families live on uncooked meats, and no doubt some of us live in the same way. All our animals are liable to parasites. It is a common error to suppose that the pig is the only animal that can contaminate the human system. I have known considerable trouble to arise from beef. It seems to be the case, and it is true, that pork is somewhat liable to the attacks of parasites, but beef itself contains one of the parasites that bring tape-worm. The danger of eating raw meat arises not from the eating of the raw meat alone, but from the fact that cooking is required to kill the parasites. I am not of the opinion, however, which has been advocated in one of the leading papers of Philadelphia, by a very well-known scientist, that we can depend upon the destruction of all of these parasites by cooking, but it is not unlikely that with the cooking of the meat it will all reach this temperature required to kill. It is therefore better to regard the cooking, under ordinary circumstances, as unquestionable, in order to kill these forms of life, and the more certainly to prevent this meat being injurious. The point that I aim at in this connection, is also to prevent the use, if possible, of such meat. When we eat our food for the benefit it does, we ought to be careful in the selection of meat; and to prevent any possible error, we should rely on thorough cooking, and thorough cooking alone. Of course it is a matter of obligation to assist in preventing these things in the first place, but in order to avoid the danger which threatens, the habits of the people are also to be taken into consideration. Therefore, the complete cooking of our food is a matter of some moment. It is not only with reference to meats, but vegetables which may contain, in their leaves or in their structure, parasite forms. Whatever may be the origin of the cooking of food, wherein man differs from the animal creation, we have a reasonable scientific basis now, and if it were necessary to defend this systematic cooking in reference to every other, this protection in regard to parasitic food would be sufficient.

The subject of adulterating food is one, also, of great importance to us. I have expressed, I think, to the Board at a former meeting, that the system of adulteration is not strictly of an injurious character, and my observations recently confirm this view. Most of our adulterations are deteriorations, and there is no reason that disease should be much spread thereby. There is just as much fraud as if poison were used, but the majority of the articles are likely to be diminished in value as food by the addition of, generally, some comparatively harmless substance, as the addition of water to milk, glucose to ordinary sugar, and the adding of sulphate of baryta, or barytes, which is said to be used in some cases, but is not in use as an injurious material. Something is used that simply prevents the full use of the nutrition from the food itself.

In regard to protection in hygiene, we cannot trace many diseases to food, so far as direct adulterating is concerned. I will simply say, in reference to one form of adulteration, which has excited a good deal of attention of late, the use of glucose, which is formed from other substances, somewhat as the ordinary sugar is formed from the cane. It is not hard to digest, but in taking that into the stomach with other food we are saving the stomach that much work. There is some nice discriminating here on the part of those who are engrossed in the subject of minute physiology, as to whether the stomach is not injured by this. If we save a man from walking, we do not add to his healthy condition. The fact of absence of exercise, is not a condition to be desired; and if a man is lugged around, so he cannot move, he will not gain thereby. If a man has not the power, by reason of sickness, to move around, he becomes weakened; or if a man makes no use of one of his limbs for some time, it will require, ere long, stimulation to prevent its passing into a debilitated condition. Now, it may be conceded, if we save the stomach by adding glucose, we do not aid the stomach, but rather take from it. If we diminish its exercise when it is in a healthy condition, we thereby weaken it. I do not say it is proper in that sense, however, that the addition of glucose to sugar is a disadvantage. It is just as much a disadvantage as our ordinary habit is of doing away with exercise, and resulting in the absence of muscle. Food is of great variety, and though we deprecate this adulteration, much of the adulteration in it, I repeat, seems to be harmless. We find adulterated sugar, coffee, tea, and alcohol, as those which have attracted the greatest amount of attention; but most of these articles show that the ingredients used are rather of a negative character.

I might say in passing what may be of use in regard to candies. Candies are largely adulterated, and even the clearest candies. It is difficult to melt them unless of pure sugar. We found that some are colored by the remains or ingredients largely of preparations of lead. The dark colors were of lampblack; the white ones of the nature of chalk, and the clear ones of sugar refuse; the yellow candies were mostly adulterated with substances you would not like to have. The green and the yellow were the most unsatisfactory, from their coloring ingredients. Of all these grades of candy, those which were clear seemed to be nearest the condition of cane sugar. The spongy candies are generally made of large quantities of glucose. A familiarity with these compositions would be of great importance in a large household, where health is considered.

I read the other day a paragraph in some journal advising where a physician should start into practice. He "should choose a locality where the drainage was defective; where the soil did not allow the water to flow off very well, and they allowed it to accummulate, and where new houses had been put up in a careless manner as regards sewerage, &c.; that he should take care to select an old house to live in, well built and well drained. There, with attention to business, he could study hygiene, and practice with profit. If the ground were made up largely of a mixture of old tomato cans, old bottles, dead animals, broken bricks, and various things of that kind, it would greatly add to the disease that would be sure to spread in that locality by the other conditions." But the question of such a locality is more, I think, for public engineers, than one of purely hygienic importance. It is one that those who lay out cities should understand. They should also understand "Hygiene in the Household," in which is included drainage for the household.

Now, after one or two points. I will bring my remarks to a close. We make a mistake in our endeavors to conceal refuse from view, rather than getting rid of it. If I had authority to order how drain pipes and supply pipes should be arranged in households, I would pass a law forbidding any person concealing water pipes, gas or drain pipes. Gas pipes are continually leaking, and when they are concealed from view, expensive and troublesome to repair; consequently when they begin to leak they must leak badly before they are repaired, because of the difficulty and expense of getting at them. Water and drain pipes are also hard to get at generally, and we find, therefore, a large train of influences of an unfavorable character arising from the fact that the people do not wish to go to the expense of having those repairs made. If these water pipes, and those for carrying off refuse matter, were where they could be easily reached, then we would have them repaired, because their bad condition would at once become very prominent. It is because the odor of these pipes is not distinctly appreciable when they begin to leak, that we allow them to go on, with their defective draining, poisoning the household. I am not a believer in any of the ordinary systems of traps for drains of any kind. The majority of them are so complicated that they do not work for any great length of time, and get out of repair. The simplest forms of pipes are not fit for use. Even with the siphon the gas will escape whenever it is opened, and while preventing escape at one place there will be diffusion at the other. In this way gas gets into the house, and does a great deal of harm. I am sceptical about many physicians who attribute no bad effects to this gas, and who want to say the air is not polluted in this way. It is certainly a mistake to connect a system of pipes with these sewers, and allow any outlets to these sewers except deep enough in the water to cover the surface when the water is passing through, or even where they are so emptied, fo have gas passing through them. I think that the waste drain—the ordinary gutter—is by no means so bad a thing as some would make it out. When Mr. Waring spoke in Philadelphia, some years ago, on the subject of drainage, being somewhat distinguished on this subject, he was asked to condemn the Philadelphia system of open gutters. He declined to condemn the system, and very wisely, for they certainly save us from a large amount of sewerage impregnation, and also from the bad effects of leakages in gas and other pipes that must drain themselves into the sewers. In these sewers we have a large collection of decomposing matter doing more harm than when seen, because when open to the air and light. and the movement of the water, there is a prevention of the accumulation of those deadly influences which give us an unhealthy city. In spite of the building of open courses and open gutters at Reading, we find the mortality of the city comparing very favorably with other cities. I think, in view of the danger of sewer gas, and of the fumes of our closed drains entering our houses, it is more reasonable to suppose we shall have better health, when the drainage is passing along in the old-fashioned way through the middle or both sides of the street.

AGRICULTURAL EDUCATION.

By Professor S. B. HEIGES, *of York.*

Read at the annual meeting.

MR. CHAIRMAN AND MEMBERS OF THE STATE BOARD OF AGRICULTURE: It affords me sincere pleasure to appear before you this evening. I have not come here for the purpose of delivering a lecture, as has been announced by the chairman. I believe a lecture consists of an exordium, an argument, and a peroration. I shall skip the first, begin with the second, and beg you to excuse the third. I have come here for the purpose of talking that I may hear you talk. As iron sharpeneth iron, talk should develop talk. And I have selected as my theme this evening, "Agricultural Education."

Charles Dickens has truly said—not in the exact words, but I give the thought—that there is no portion of a farmer's holding deserving more thorough culture than the little spot within the ring-fence of his skull. I want to show, with your assistance, that there are some means by which this little spot within the various skulls of the agriculturists of Pennsylvania may be developed to the highest degree of culture.

There exists in every State two generations at one and the same time—a generation of manhood and womanhood; and the latter factor is not, by far, the less important, from the standpoints of intelligence, thrift, and power; and the rising generations, such as those who are attending the various schools in the good old Commonwealth of Pennsylvania, whatever rank or grade those schools may be. We ought to devise a means of education for both of these generations. Those of us who were schooled in the olden times, before the scientists had made such rapid strides; those of us who, from force of circumstances, are less familiar with these scientific principles and their application than need be the rising generation, ought also to be educated. And there are only two general means of education—the objective and the subjective. Those of us who have left the school-room, learn most rapidly and learn most thoroughly by the objective rather than by the subjective system; and we ought to devise some means by which all of the farmers, their wives, sons, and daughters may become more thoroughly educated. A great many of our county agricultural societies have already been established, and in many counties they have a permanent organization, and have purchased ground, upon which they have begun improvements, which will be permanent unless they are driven from their position, as no doubt they will be in the course of time. In those counties in which there are permanent organizations we cannot expect to remedy the defects existing in their operations; but in such counties as have only leased properties, or have not permanently organized, I think we can devise a plan this evening which, with your coöperation, will tend very much towards working out this problem of agricultural education for the masses—for the manhood and womanhood of Pennsylvania.

It has been my pleasure, as it has been my duty, to be connected with one of the large agricultural societies of Pennsylvania. I refer to the county association of York. I have acted in the capacity of secretary and president, and I have found in both of those positions that we were not accomplishing the work we ought. A great many persons think the entire object of such a society is to hold a fair once a year. By doing this, they accomplish something, of course. Men and women are brought together; old acquaintances are renewed; new methods of cultivation are exhibited; better breeds of stock, and better forms of agricultural machinery, &c., are placed upon exhibition. Yet this accomplishes very little. It is but a drop in the bucket of general information that ought to be disseminated throughout the length and breadth of this land. The use of grounds but one week each year does not teach a good lesson in economy. The problem is, how shall societies accomplish more than this at the present time? I will briefly give you my plan, so as to bring something before this body for discussion.

I believe, if it were possible for every society to purchase and have control of a farm, a great amount of good could be accomplished—more good than is being accomplished upon our experimental farms. These experimental farms are most likely to have the same character and quality of soil predominating in the county where they are situated. Our three experimental farms contain soil entirely different from that in many other counties of the Commonwealth of Pennsylvania. I have visited quite frequently the experimental farm at West Grove, Chester county, and I have followed the same methods and operations in the county of York, and have met with results entirely different from theirs. Fertilizers that they would condemn, I would be obliged to approve. Certain kinds of wheat that they condemned, I would be obliged to use, and so with all the cereals; their results and operations differing entirely from those that I have used in my own little experimental plat. Why? From the simple fact that the soil is of an entirely different character. It is of a different geological formation. Entirely different in its chemical structure, and, of course, the results will be different. As I have said, and now repeat, it is most likely that the quality and character of soil on those experimental farms in each county will be the same as the soil of that county.

How should these experimental farms be conducted? As an experimental station entirely under the control of the agricultural society. It may be suggested to your minds that the Government ought to do this, and you may refer to the governments of Europe, which have experimental farms and experimental stations. But our Government, it must be remembered, is different in its genius from those of Europe. We are an independent people, we are a free people, and there is nothing that so trenches upon our rights and privileges, we think, as for the Government to take hold of and do what we, as individuals ought to do. And I think the day is far distant when this Government will take hold of this problem and work it out as it has been in Germany and other nations in Europe.

There should be placed upon this farm a good, practical, scientific farmer—one thoroughly conversant with all the departments of agricultural science.

This farm should be laid off into plats, as at our experimental farms, and all the various kinds of fertilizers should be applied to each section of, say, a quarter of an acre, or a half acre.

There should be an accurate account kept of the various methods of cultivation. Our crops are now of such a character that by the first week of October we can have all these crops gathered. What should be the plan to exhibit results? There should be placed upon each one of these sections a large placard at least three feet in length, and a foot and a half or two feet in width, having placed upon it the results obtained upon that plat, and have it displayed prominently and distinctly, so that all the spectators who visit there can read the results on each and every plat.

That is what we mean by objective teaching—that teaching which is most powerful upon the mature mind, upon those who have left the schoolroom.

Say, for instance: "Plot No. 1; seeded 15th of September with Mediterranean wheat, one and a half bushels per acre; fertilized by applying at the rate of four hundred pounds of superphosphate of lime; result in straw, so many hundred pounds; result in wheat, so many bushels per acre." Let the next section have another method applied, and an application of another fertilizer. And there should be certain sections on the farm to which there should be no fertilizer applied, either natural or artificial, and certain sections upon which barn-yard manure should be applied at an equal expense per acre. Carry out an account upon each section.

Then, those farmers and their wives who go to the fair, instead of sitting down from morning till night, waiting for something to turn up to amuse them, can pass through this section, and learn from it what is most applicable to their own soil, and which of these fertilizers is most profitable.

I would carry out the same operation with all the cereals. With corn—the various methods of planting in hills and by drilling, the various distances, the different number of stalks to be allowed to stand in each hill, the various kinds of fertilizers, and carry out the results. Have these results placed upon these boards, so that every person can see; so that the wayfaring man, though a fool, need not err therein. The same way with the grasses, so as to learn which is the most profitable, and the best method of top-dressing, and the best top-dressing.

And thus I would run through all the agricultural products, and if I had the power thus to organize a society, I would have the life members of that society to act as a committee to decide upon the best breed of cattle for that farm; and I would have just as careful experiments conducted with the animals, always, as with the vegetables. I would have the very best stock that could be bought placed upon that farm, and it should be held out as an inducement to the stockholders and life members of the association, that the excess of stock raised upon that farm, over and above what is needed for the farm purposes, should be disposed of to the life members at cost.

I would have the same with swine and with sheep; and I would have the members of this society decide which is the best breed of horses for general farm purposes; and I would have the excess of stock raised upon this farm disposed of in the same way. I would have the life members have the use of these breeding animals for the purpose of improving their own stock, bringing their animals to the fair-ground, and having the use of them for that purpose; and I think, in the course of five years, there would be a greater improvement in all kinds of live stock than can be brought around by these men who travel from county to county with their horses, having their legs swaddled with red flannel, and leaving not a drop of pure blood anywhere. I would also have careful experiments conducted in the various forms of feeding. I would have the farmers and their wives learn the distinction between fuel and food. I would have them know that a great deal that is given to cattle is merely fuel instead of food, and that very frequently they litter the cattle with better food than they put into the rack for them to eat. I would have them understand this by carefully conducted experiments.

This is a brief outline of what I think could be accomplished by every agricultural society; that is, where there has not been a great expenditure of capital in permanent investments. But the ground of any agricultural society lying adjacent to any thrifty growing town, can be laid off into town lots, and disposed of at a great profit, and a farm a little further off can be bought for perhaps what a few acres in the immediate neighborhood of town are worth.

That is the only possible means, I believe, by which the manhood and womanhood of our Commonwealth can be educated agriculturally. And that they need education is evident to every one. I believe that the farmers are perhaps more intelligent than the members of any other calling, except the learned professions, and I believe so from having associated with them year after year. It has been my good fortune to fill, or attempt to fill, the position of county superintendent in one of the large counties of Pennsylvania, for a term of six years. In that position I came in contact with nearly all the farmers of the county, and I have spent the night with a great many of them during those six years, and I have engaged in conversation with them, and I certainly agree with that sentiment of Benjamin Franklin, when he said. "If you wish to learn anything from a man talk to him about his business." I talked to those farmers about farming, rather than about education, or law, or medicine. I believe they are as intelligent a body of people as any other calling, except the learned professions, and yet I say—and I carefully weigh my words—that from the condition of the schools in which they were educated, and the time when they were educated, (before these rapid strides had been made, and when science was not so largely associated with agricultural pursuits,) it is utterly impossible that they should comprehend these subjects. I have spoken to them on topics discussed in our agricultural papers, and I selected one of the very best agricultural papers, the *Country Gentleman and Cultivator*, published at Albany, New York, and I found that there were sometimes as high as a dozen articles in every issue entirely above the comprehension of any farmer, articles written apparently by practical men, practical farmers, in which they wrote out their observations and results, yet shooting away over the heads of our farmers; and this from the simple fact that our farmers had no means of learning all these things, while the writers of these articles thought that all other persons possessed the same knowledge that they possessed.

As an instance, a very intelligent man, within the last three weeks, remarked to me, "By what means do they get alcohol in these siloes?" (That is one of their disadvantages, sometimes too much alcohol is developed.) I question him, not as if I were a lawyer and he a witness on the stand, for the purpose of confusing him, but for the purpose of drawing him out just from this standpoint of examination to which I have referred, and I learned that he thought there were no possible means by which alcohol could be produced, other than by putting it in a still and subjecting it to the action of heat, as in the distillation of whiskey, apple-jack, and brandy.

Now, these are facts, and facts, perhaps, that may be a revelation to you. You may think they cannot exist, but I tell you they do exist, and exist everywhere; and if you were to resolve yourselves into huge interrogation points, as every county superintendent must do in the examination of teachers, and go around and question these farmers, you would be convinced, as I am, that these facts do exist. Should it be so? Every intelligent man would say, "No, by no means." There is no calling involving so many intricacies as that of farming. I can think of no calling involving so many, requiring such knowledge, such broad and liberal knowledge of natural and physical sciences, as this same calling of farming. Even after you have your soil in the very best condition mechanically prepared, and even after you have it in the best condition chemically fertilized, and after you have secured the most noble seed, it is not an exact experiment. We have the wind, the hail and snow, the drought and flood to contend with, besides myriads in the insect world, and spores in the atmosphere poisoning almost every form of growth. With all of these the farmer should be thoroughly familiar, so as to battle and contend against all of these difficulties, and successfully to contend against them.

And then there is another consideration: We ought to, and must, make two bushels of wheat grow where one grows now. It has been said that he who makes two spires of grass grow where but one grew before, is a benefactor of the human race; but we will be compelled to make two bushels of wheat grow where but one grows now, and I need not dwell long upon this subject. Those vast fertile fields in the west that can be acquired by merely taking possession of them, and that are being taken up so rapidly by the honest yeomanry of Europe, driven by despots from off their native soil—these lands are being cultivated. In the year 1881, upwards of seven hundred thousand foreigners came here, and it is presumed that they brought with them $50,000,000, and the greater portion of these $50,000,000 is turned to agricultural pursuits. From their cheap lands and from their fertile soil, and also on account of the competition of these various grand trunk lines of railway, and their means of reaching the seaboard, they will flood us, after a while, with cheap wheat, cheaper than it is now, and if we wish to retain these farms upon which our fathers lived, we must raise two bushels where but one grows now. And it is possible for it to be accomplished.

But I came here, as I remarked, merely for the purpose of hearing you talk, and not for the purpose of hearing myself talk. I shall leave, with these few brief, rambling remarks, the education of the manhood and womanhood of Pennsylvania, and inquire next, How can we better educate the rising generation? How can we better educate our sons and daughters who are now attending our public schools and other institutions of learning, so that when they come to occupy these farms which we now occupy they can make the soil respond more bounteously than it does now? Can it be done by the Department of Public Schools just opposite to us? No. From my experience as teacher and superintendent for upwards of thirty years I am convinced of the fact, as no doubt you are, that a great many of our public schools have already too many branches of study. They could accomplish a great deal more if they were to lop off instead of engrafting.

Then this education cannot be imparted in our public schools. How then? By our Agricultural College? I suppose you have gone through the same ordeal I have. I have spent day after day—not the entire day, but a portion of day after day—and week after week, in inducing some farmer's son to possess himself of the liberal advantages offered by the Agricultural College in the granting of a free scholarship, and in the whole county of York I could obtain no one, and if I am correctly informed through the papers, there was not a single county in the State of Pennsylvania that accepted that offer. Am I wrong? (Addressing Prof. McKee, president of the State Agricultural College.)

Prof. MCKEE. You are wrong; a few counties have accepted the free scholarship.

Prof. HIEGES. Like angels' visits, then, they were few and far between.

Prof. MCKEE. There are not one fourth of the counties represented there to-day.

Prof. HIEGES. Why? From the simple fact that our boys and girls are not educated up to a want of this knowledge. They must feel a want of this kind of instruction before they will go there voluntarily or involuntarily. We want to educate them up to a desire for this kind of knowledge, and I have thought out a plan that is entirely feasible, I think:

The Commonwealth last year expended upwards of $7,000,000 in education, apart from the interest of the money invested in the erection of school buildings, and apart from the wear and tear or natural destruction of those buildings. Upwards of $7,000,000, I say, were expended in educating the rising generation. A portion of this, and not a very small portion of it, was but poorly applied, and I want to tell you why. In these schools of ours in which boys and girls are found from the minimum to the maximum age, in which is placed but one teacher to pass over this entire round of instruction every day, there is not given attention enough to the larger boys and girls. They sit there idly a great portion of the time, and it is repugnant to their natures to associate with these little boys and girls who are not so far advanced, and they feel it an imprisonment to be kept there. The teacher cannot give them that proper attention that should be given them, and hence they fritter away their time, and when they leave school they have accomplished but little. Think of it! Young men or young ladies, sixteen, seventeen, or eighteen years of age, sitting there daily for from four to six months of the winter, in a public school and accomplishing comparatively little! If you question them, as I have done hundreds and hundreds of times, you will learn that they are about as far advanced in each study as they were when they began school in the fall, and that is about all; it has been a mere review to them; there has been no new gleaning in the fields of knowledge; they have been sitting there idly, and perhaps have been worse than idle, because in the schools I have visited for investigation during my term of superintendency, I have found that almost every act of insubordination, and almost every disturbance, came from these big boys and girls who do not like to come under the government of the teacher. Can we not devise some school in which they can be trained in these branches, in which they can learn the thousand and one facts so important to farmers and their wives? I think we can, and this is the plan:

I would have in each township a central school to which these large boys and girls should go. They are sufficiently developed physically to walk a mile or two every morning and evening. The schools are in operation during that time of the year in which there are no great farming operations going on, and also when the horses are standing from morning to night and had better be exercised, and a team could be taken out to gather up the pupils as they do in Massachusetts and take them to the public schools, and I venture to say that a live teacher will work out wonderful results in such a school. He would gather in these large boys and girls and would develop a thirst for knowledge, and soon they would begin to inquire: "Are there any possible means by which we can get to the agricultural college and go on further and higher?"

I would teach in these schools the principles of botany. I would teach boys and girls to discriminate between annuals, biennials, and perennials, and I would teach them to discriminate between wheats. I would teach them if they removed the low mullein they will never have to remove the high mullein with its glaring head or yellow—an index of shame, as it ought to be an index of shame on the farm possessed by any intelligent man. I would teach them how to exterminate wild carrots and all other noxious weeds by knowing how to strike at their root, having learned their habits.

I would not only teach them the principles of botany, but also of animal physiology. I would have them understand the laws of digestion, the laws of circulation, the laws of respiration, and then after a while they could take up an agricultural paper and know what is meant by carbo-hydrates in the articles of food which make heat and heat alone, and a great many farmers feed them when, by so doing, they are just increasing respiration, consuming food, instead of utilizing and building up. I would have them understand what the albuminoids are, what the fats are, and I would have them get the value of the various kinds of straw, and then they would understand, what is now the fact, that very often better food is put under the feet of cattle than is put into their stomachs.

This can all be taught. I am treading on the toes of no person here, because there is no liberal-minded man but would agree with me in this respect. The more highly you educate the people the more thoroughly are they enabled to perform their business in life. I would have the boys and girls understand how to graft and bud, by taking a grafting knife and saw and going out on the spot where the seedlings are, and I would teach them the actual operation, so that their young and thrifty orchards of profitless varieties of fruit trees can all be turned into marketable fruits. I know there is not a nurseryman here that would object to that.

And thus I would go through the whole range of experimental farming. I would have them understand, by actual experiment in the school-rooms, the proper temperature at which milk should be placed so that it could be converted into butter—that little narrow range passing over only five or six degrees at the extreme.

And I would take them a little further than that. I would make use of the microscope, and have them go with me where there were diseased peach trees, pear trees, and shrubbery, and I would have them detect, through the aid of the microscope, the agent bringing on the disease; and then I would appeal to chemistry to apply the remedy; I would apply the most available remedy known to modern chemistry for the destruction of the fungi.

And this can all be successfully accomplished. The question will then arise in your minds, " Where are we to get the teachers for these various schools?" There might be ten, fifteen, or twenty schools of this kind established in every county. Where there are small townships of five or six schools there could be a joint school between townships. The law advises the establishment of joint schools now for the convenience of patrons, and there could also be a joint school of this kind established. I have said the question has arisen in your minds, " where are we to get teachers for these schools?" They require teachers of peculiar training and thorough drill. That should be province of our agricultural college for perhaps a quarter of a century yet, to send out men—yea, and women too—thorougly qualified to take charge of these schools. We have erected and maintained at great expense a system of normal schools throughout the Commonwealth, for the training of our common school teachers; and cannot the agriculturists, the great founders of all wealth, (an assertion no political economist dare deny)—can they not assemble here through their committees and compel the Legislature to provide means of qualifying teachers for schools of this kind? That power is with the people and for the people. They have only to learn this lesson, that the power exists with them, and then they should have the manhood to exercise that power, and the teachers would be forthcoming.

I have thus briefly outlined a plan of education for the generation of manhood and womanhood, the farmers of the present day, and have outlined a plan for the education of the rising generation also—those who are to take our places; and I hope to live to see the day when schools of this kind will be established; when it shall no longer be pointed out to me, as it has been pointed out to me, in New York and other States, that this great Commonwealth of Pennsylvania, with its fertile valleys and fields, does not raise wheat enough for its own people. Let us remove that stigma, if possible. It can be done, and it can be done by just such a body of men as have patiently and kindly listened to me this evening. It is not the work of the Government; it is the work of every earnest and ardent friend of agriculture, and God speed the day when means of this kind shall be presented to our sons and our daughters.

Col. **YOUNG.** Would it not be better if our sons should not spend so much time in learning Latin and Greek at school? Give a young man a good education, put him through all the different grades, and by the time he gets through he is a great big fellow and won't work. What we want is to let the boy have a through education, but we want him to work, too. The truth is that if he has this good education he is too smart to work, and he won't work, and I would not either if I were in his place.

Prof. **HEIGES.** Gentlemen, I am accomplishing what I hoped to accomplish. I am having the advantage now of hearing you talk. Let me say one word more: If they were to pursue these subjects in the various departments of natural science that enter so largely into this calling of ours, they must be familiar with Latin and Greek. Every scientific term is coined from one or the other of these dead languages, and they must be so from the fact that they are dead languages for the reason that the living languages are always changing while the dead ones remain fixed. That is why scientific terms must come from the dead languages, so as to be thoroughly embedded and to undergo no change, so that a word will mean to-day just what it will mean a hundred years hence. That is why Latin and Greek are so thoroughly essential—Latin more particularly than Greek.

Prof. **JORDAN.** I can tell Col. Young how to make a boy lazy without work. If he likes work he will work. I have seen boys lazy and I have seen boys that were not lazy. I do not think I was a lazy boy myself. If a boy is lazy and has a profound dislike to work, forcing him to work won't put him in love with it. Will you suggest how the man who despises work can be made to like to work?

Col. **YOUNG.** I look at it in this light: Let him have an education, and work with him from the time he is little, and then you can make a worker out of him. But let him go to school until he is fifteen or sixteen years old, without working at the same time, and he cannot work. He thinks it is impossible. Get up schools that will teach them to work at the same time they are getting their other education. You cannot accomplish the desired result in any other way. If a young man says he is going to be a farmer, let him go in that direction, and the same way with doctors and lawyers. But if you want them to work you have got to start them in that direction when they are young. That has been my experience, and I have had a good many of them. If I have a hired boy with me two or three years, he is very apt about that time to go into some manufactory or into the employ of some corporation, where he thinks he can do better than with me.

Prof. **JORDAN.** I certainly agree with Col. Young that a certain amount of duties and work in a boy's training is very essential as a part of his education. That is the reason why our farmers' sons make men who are pushing men, and who know how to be industrious whether they remain on a farm or not—because the duties that are assigned to them, because the life the farmer lives, gives them an idea that there is work in the world, work to be met and work to be conquered.

I will say that I enjoyed very much the lecture of the evening, and one or two thoughts have occurred to me in relation to it. I think there is one fact that is too much lost sight of, and that is that the man determines the success of his calling, rather than the calling determines the success of the man. In other words the man makes his calling. The question was asked by Col. Young, why teach a boy Latin or Greek or any of those branches of learning which do not apply directly to agriculture? It is generally acknowledged that the men of the learned professions are men of greater ability and greater success, in their way, than the average farmer; and farmers very often complain that the professional men are the men who are taking the high positions in the gift of the people. That they are controling affairs in the State and in the nation now. Why? Not because those men understand their professions any better, perhaps, than the farmer may understand his, but because the intellects of these men have been trained. When you develop a man's intellect, you may not give him technical instruction about his calling, but you have given him a tool which is worth more than any other tool you can put in his hands, and that is the mental power to grasp any problem which he may attack. The objection which Col. Young raises is, if you educate a man up to a certain standard, he will leave the farm; and I think Col. Young recognized one fact when he said, he would leave the farm——

Col. Young. If I was a boy in like position I would leave the farm, I said.

Prof. Jordan. If you could get a position where you could do better than on a farm, you would leave it?

Col. Young. Yes.

Prof. Jordan. Can you blame a young man, then, for that? He is not to blame, education is not to blame, no one particular thing is to blame. Because to educate a young man sends him off the farm do you say, "Do not educate?" or will you adopt the suggestions, many of which were made by Prof. Hieges to-night, and educate society and business and everything up to the point where the young man can meet his ambitious projects in agriculture? I believe that we must educate, and because education sends some boys off the farm, do not get frightened and stop. The time is coming when education will send fewer and fewer from the farm, and the number that are being educated, and who will take hold and manage a farm, is increasing every day. I have a suggestion to make in connection with what Prof. Hieges said, and that is that these schools be somewhat under the German plan of winter schools. Let the boy work on the farm in the summer, and after he has got to a certain place in the common schools, then give him the privileges of the winter schools into which shall enter more or less of instruction in the natural sciences. Our agricultural colleges throughout the States cannot educate the masses. They should form the capstone in agricultural education, and, in educating scientific men and investigators, they are doing for agriculturists a grand work; because we have to-day scientific men, veterinary surgeons, and investigators in various ways, who have come from these colleges. I have a friend, a very good veterinary surgeon, who was a college mate of mine in an agricultural college, and he is a legitimate outgrowth of such an institution.

I do not mean to say that many more young men might not be educated at our agricultural college than have been. I do not mean to say that the sons of farmers of some wealth, who are to inherit the paternal acres, or even poor men's sons who are ambitious to rise above the general level, might not make their farming operations more successful and their lines larger and broader in every way by taking a scientific course of study, and obtaining a true conception of the way in which scientific truths may be applied to the practice of agriculture. But the idea that one college can educate all the future farmers of this great Commonwealth is absurd. The only means of doing that is by a system of generally distributed schools, of a somewhat low grade, that shall teach the rudiments of the sciences and thus open the eyes of the to-be-farmer so that he can see truths where otherwise all would be mystery. Such schools would serve to awaken a desire for more knowledge, and the time would come when even the agricultural college would not lack students as it does to-day. For it is a fact that the dearth of students of the application of science to agriculture, in nearly all our agricultural colleges, is due not so much to defects in those institution as to the fact that there is a small demand for the technical education of the farmer in a thorough and extended manner. But where such a demand greatly increased so that large numbers of young men were to knock at the doors of the State College for admittance, thus enabling the institution to graduate immense classes each year, the masses of the farmers would not then be its alumni, although the masses would be greatly benefited and the interests of agriculture rapidly advanced by the efforts of the trained minds enlisted in building up the greatest industry of the world. To insure anything like a general distribution of the desired education there should be at least one winter agricultural school in each county of the State.

Do not depend upon the State or the Government for these. Let the farmers of the State take the matter into their own hands, and I believe that they may establish winter schools, and even if they cannot find teachers just of the right kind at first, the number of such men is increasing, and they may through their own efforts educate their children in those sciences that pertain to agriculture, during the winter months when they are not busy. That is the plan that has been carried out successfully in Germany. There they have a low school, a middle school, and a higher school, which is the agricultural college. They have that system, grading from the lowest to the highest. In this country we have neglected the lowest, and from the misconception in the mind of the public as to what the agricultural college can do has arisen a great deal of trouble and dissatisfaction.

Col. WALLACE. If you want to retain a boy on a farm teach him that labor is noble. Associate with him. If you want to retain a girl in the kitchen or about your house, teach her that labor is noble; associate with her. Do not have them shut off in the meanest corner of your house, but put them in a corner of your room. Make it comfortable for them and then they will serve you right, and stay with you. Have them sit at your table and eat with you. Teach your children that they are no better than the hands you have on your farm, and have them work and associate with them. I learned when I was in the army that if you would lead your men they would follow you any place you would take them when they had confidence in you. And it is the same way on the farm, and it will be the same with the boys. If you can just get them to understand that labor is noble, then they will remain with you. But if they get an idea that you feel that they are merely your servants, that you look down upon them, they will not stay with you.

Col. YOUNG. I get up every morning at five o'clock, and eat with them, and ride out with them.

Col. WALLACE. So do I, and I go with them to church and take them to Sunday school.

Col. YOUNG. Most of them won't work if they can help it. I have had young men from New York city and all over the country sent to me to learn farming, and when I get a young man fifteen to sixteen years old, and can teach him to work, he is more likely to turn out a good man. That has been my experience. As to mixing with them, I do that as much as any man in this country.

A MEMBER. You ought to impress them with the idea that they may have to work harder off the farm than they do on it.

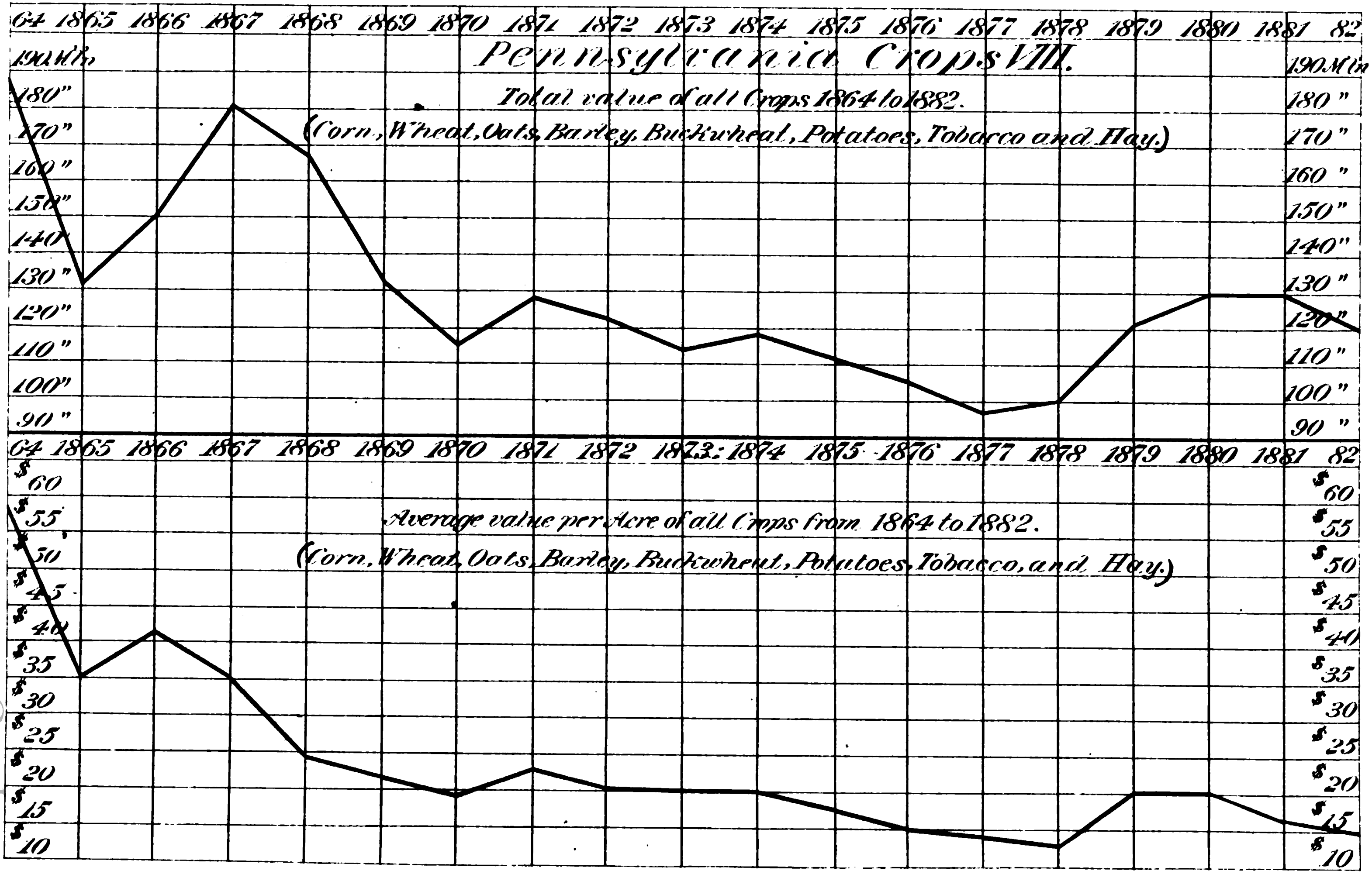
Col. YOUNG. You cannot do that. When it comes down to farming, you gentlemen know this: That there is nothing but work all the time, and lots of it.

Prof. WILSON. Mr. President, I think the Board owes to Mr. Heiges a vote of thanks for the address he has delivered. He certainly is full of suggestions, some of them very useful, but, it seems to me, that in the first part of his address, an objection will arise at first in the minds of almost everybody, and that is as to the impracticability of it. It reminds me of the fable of the rats and the cat. The rats held a council to ascertain how best to guard themselves from the cat. It was proposed that a bell should be put upon her so that every rat could get out of the way when hearing the bell. The action of the council was approved of by the whole assembly of rats, but when it was asked who should place the bell upon the cat, nobody was found to do it. Now, that appears to me to be the thought that will arise in the minds of almost everybody in regard to the first part of the address, as to the experimental stations. I listened to him with great interest and great attention. Suppose you have fifty plats of a square rod each, including your wheat, rye, corn, and grass. Plow them, and sow them, and cultivate them, and note down the quantity of manure, and when ripe weigh the wheat, for instance, in the sheaf, and then dry it and thrash it in the straw, and then weigh the wheat by itself. All these things would require a great deal of labor and a great deal of time, besides a large building to accommodate it all. If that can be done, it would be a very good thing, a very good thing. But to do that, to make an experiment of that kind that would be worth anything to the farming community—take Dauphin county, or Berks, or Lancaster—we mountain fellows do not speak of our own at all, but take those other counties, or any of the eastern counties, and leave the mountaineers alone—those counties could hardly afford to do that. Farmers are thrifty and frugal and make their money by hard labor, and when they get their money they are just about as careful in parting with it as anybody else you can find. It seems to me that Prof. Heiges' suggestion as to experimental farms, even small farms of twenty acres, would be almost impracticable, because it would require a great deal of money to run them, and would require a great deal of care as well as a large amount of preparation. If it could be done, I think it would be a good thing, but it seems to me it would be so far beyond the reach—almost beyond the aspiration of most people—that it would amount to nothing at all.

I think much more favorably of his second suggestion in regard to educating the rising generation. I believe, and have believed for a large part of my life, that there is a great mistake in the way our common schools are carried on. You are piling on study upon study, and mixing eighteen years with eight years, and it is very difficult to manage a school of that kind, especially with one teacher. I think it would be far better if the curriculum of the common schools of Pennsylvania was restricted to a few necessary studies; such studies as give a child a thorough knowledge of the English language, and almost as thorough as can be secured in any school—such an elementary education as would enable him to engage successfully in almost any ordinary business. That is about what common schools can do, as a general thing, and that is about all they were intended to do originally; and I think that when the school life of a child is only from six to sixteen, it is fully as much as any school can accomplish. If the child wants more than this, let other means be provided for him, or let him provide those means for himself. Why should the people of the State be taxed to give the sons and daughter of one man a complete and extensive education, which it is a fortune to have, whereas the children of other men have to labor for the property that they acquire? I am just as much a friend of common schools as anybody can be, but I am not the friend of carrying them beyond their proper province. I say, let the child be educated thoroughly in the elements of a good English education, and whatever they want more than that, let it be provided by their friends or by their own efforts, just as men procure farms, and stores, and professions. But in regard to industrial education, I think that is a matter of extreme importance to farmers. Why is it that the farmers of the United States, although a numerous class, and lying at the very foundation of all wealth—why is it that, although they are the most numerous, and amongst the most useful and influential citizens in every way—why is it that, as a class, they do not exercise the proper influence in politics, society, and religion? Why is it that they do not exercise the influence that their rank, and their numbers and character would make it reasonable that they should exercise? It is because they are not properly educated. If we can engraft upon our system of education anything like industrial schools, giving the large towns and cities schools where the girls shall be taught to sew, bake, and scrub, and the boys to saw, bore, and chisel, and do all such work as men have to do in wood—I mean all the ordinary rougher work in wood and in iron—that would be a good thing for the industry of the country. All men cannot be professionals—cannot be teachers and doctors, and preachers and lawyers. All men have to work at something, and we cannot live without it; and if we want to have better farmers, let us instruct those who are to be farmers as much as we can in those industries which lie in their direction. I was pleased with Prof. Heiges' suggestions very much, and I mention these things only to elicit more talk.

Prof. HEIGES. I may have been so unfortunate as to be misunderstood, but I do not advocate more than one farm in a county, and that under the control of the agricultural society. I believe that from the better results attained on this farm with cereals, stock, etc., the farm can be made self-supporting. After a while, I believe, all of our farmers, instead of sending off to neighboring States for seed corn, potatoes, and wheat, can buy all these right on this farm, where they can have a chance to know what they are from seeing the results.

I am glad to indorse the sentiment of my friend, Prof. Wilson, and in reply to Prof. Jordan, I will say some of these operations must be performed during the summer. I have been obliged to take the boys and girls of the school with which I was connected two or three miles, and in fact, to meet certain results. I had on one occasion twelve boys to walk with me twenty miles. Certain operations must be performed during the summer months. You would have to announce to the members of the school that, at a certain time in the summer, you would cross-fertilize strawberries, or potatoes, or pears, if you carry it up into the fruits, and you would be obliged to have them come, perhaps, on a Saturday aftenoon. The farmers might give a half holiday for this purpose, and at the proper time you would have it sent abroad, through the farms of the district, that you wanted the boys to assemble, that it was now the proper time to cross-fertilize wheat or oats, and then in the spring of the year you would be obliged to teach them how to engraft, how to inoculate the bud; and in



Pennsylvania Crops VIII.

Total value of all Crops 1864 to 1882.

(Corn, Wheat, Oats, Barley, Buckwheat, Potatoes, Tobacco and Hay.)

Average value per Acre of all Crops from 1864 to 1882.

(Corn, Wheat, Oats, Barley, Buckwheat, Potatoes, Tobacco, and Hay.)

another season you would have to teach them how to prune. But nearly all the operations of general work could be done during the winter. I heartily agree that the operations would be performed mainly during the season when the boys would have least to do, but it would be necessary to call upon these boys and girls to assemble for a few days during the spring and summer.

Mr. PERRIN. Mr. President, there are few of the questions which force themselves upon us in our dealing both with man and with the material world about us that do not compel our diligent study, and no one here to-night after listening to the lecture and discussion will hesitate, I think, to agree with me when I say that few subjects require more study than those which present themselves to the agriculturist; and I am also sure that I shall be sustained in the assertion that his calling ranks amongst the most important as it certainly is the most primitive. I speak a few words here chiefly that it may be known that I agree most heartily, especially with the latter part of the lecture of the evening.

At the time he made his statements in regard to the carelessness, indifference, and indolence of the larger scholars in the schools, which statement I infer he made from his personal observation and experience, I was in hopes that he would give us both its cause and its remedy. It occurred to me at the time that the great reason for it was this: That the person placed there for the guidance and instruction of these scholars was out of place. You put an able and capable person in such a position, and in a large majority of cases indifference and indolence give place to attention and zeal. If the teacher has something to impart, and the genius and the tact necessary to impart it, is seldom that he will be troubled by the carelessness of his pupils. You must have a person well qualified to do the work that you have to do, and then you give him the means with which to work, and success may be predicted with little chance for failures. The only reason that was discovered for so much carlessness and so much indifference was the employment of a class of men to fill these positions who have had nothing to impart, as they know but little themselves. I have had a little experience myself in that line as a pupil. I remember well my school days, and I re-call something of that feeling of carelessness and indifference spoken of here to-night. I also remember well the first teacher entrusted with our school who was up to the times, and the rapidity with which he quickened our minds by reason of his being, himself a man well qualified for his work and able to draw us after him in all the departments that he taught. In that one winter we learned more, I think, than we had in five before.

Now, sir, I want to indorse most heartily the statement that was made, that the agricultural college is a place for the preparation of teachers. I think this the only just conception. In a few remarks that I had the honor to make some years ago at our agricultural meeting, I remember to have had that thought, and to have expressed it in that way—that farmers did not employ the right kind of talent to instruct their children, to prepare them for their calling in life. If you want to educate farmers, you must have a farmer teacher—that is, one who knows what he is talking about in this direction. I believe, sir, that it is within the province and power of this Board to stimulate this. Here are representatives from almost every county in the State. A little leaven will leaven the whole lump. And farmers must look to it that they employ able teachers in their schools, those who are prepared to impart that kind of information that is of practical use to their children.

There has been something said here to-night in regard to the dangers of educating too much, or the possible disadvantage of carrying on education and labor at the same time. With most farmers, it is almost impossible to do that with their children; it is all work, and here is the difficulty. The mass of farmers are not in a condition to instruct their children to work part of the time, and then to have this pleasant association with education that has been suggested; to teach them some from agricultural books and agricultural works, and thus to combine study and pleasure in such a way as to attract and hold the youth. Their financial condition is not such as to enable them to do that. They have to plod on from Monday morning to Saturday night, from spring till fall, and it is all drudgery and hard work, and that is what makes the boy want to get away from the farm. Now, sir, if we can do this one thing, I believe we will have accomplished a great work. If we can instill into the farmers of this great Commonwealth—and we need not confine our remarks to the Commonwealth of Pennsylvania; it is not here alone, but all over the broad land, everywhere—if we can instill into the minds of the farmers of this Commonwealth the necessity and importance of employing a higher grade of talent, better men, broader men—and the better and broader, the greater the achievements—to preside over the destinies of our children in the common schools, we shall have accomplished a great work. We need as teachers not only men who know something about arithmetic, grammar, geography, and rhetoric, but those who are competent to do all that has been indicated here to-night in the way of teaching them a knowledge of plants and geology, insects, fertilizers, etc., so that the scholars can take this information thus received to the farm next summer, and there experiment with it, so that when they return the following winter they can say, "Here, we have tried this and that, and these are the results."

And do not employ men for one winter alone. Let me urge our farmers to get a broad man and then to hold him. Let him remain winter after winter, so that he can hear these reports that will be brought back from the summer's toil, and be able to tell the boys whether such and such things are beneficial or not.

Let us, then, make the agricultural college a great school for the preparation of teachers, and then let us cultivate such a sentiment as a taste, a judgment, shall lead the agriculturists of our State to employ these men in preference to those that are only qualified in the ordinary branches of study. Then we shall have accomplished something of lasting and practical good.

Prof. McKEE. The suggestions in the latter part of Prof. Heiges' lecture are very good, if they can be reduced to practice; and if the members of this Board will exert themselves to realize them, it may be easier to accomplish than one would at first think. My chief purpose in rising is to recur to the question discussed in the early part of the address, and to call attention to the results of an attempt to impart such information to mature persons. During the past ten days, we have had in progress at the State college a course of lectures for farmers, intended to help them in both the theory and the practice of their profession. Now, there is no difficulty in finding matter that is useful and interesting. The wide-awake farmer who attends a lecture on the dairy, on insects, on feeding, on fruit-growing, on stock-breeding, or any equally live topic; who listens to, and takes part in, the familiar and practical discussion which ordinarily follows; and who in the interval between lectures spends his spare time in the library, reading up on disputed points, does not feel a doubt about the importance of the subject or the value of the discussion. Nor does our present course of thirty lectures include all the questions which must have an interest for every live farmer, and the consideration of which must be profitable. But the usefulness of such a coarse does not depend wholly on the importance of the subjects, the ability with which they are presented, and the interest felt, or the advantages gained by the hearers; it depends as much on the number and the representative character of those hearers, and here is found the real difficulty in the matter. The number present at our "Farmers' Institute Course" has not been such as we desired; indeed, it fell short of what some expected, though the experience of other States had taught us that movements of this kind were not genérally successful at the start. There were present with us about twenty-five farmers, but of these there came from distant points only two, one of them a member of this Board. When a sister institution, the industrial college of a neighboring State, proposed a somewhat similar course, the attendance the first year was *none*. The second year, less than ten. The third year, a considerable larger number, and the fourth year it was, as I hear, over one hundred and sixty. Our attendance, then, is not discouraging, and we confidently expect a largely increased audience in coming years; but if the course is to be not merely remunerative to those who are present, but also productive of the greatest good to the cause, there must be representatives of every farming community in the Commonwealth. If this attendance be not, in some degree, secured, the work will be comparatively ineffective; and to whatever extent all parts of the State are fully and intelligently represented, to that extent will the college be successful in its effort to do what it may for the practical instruction of farmers of mature years. But, however great may be the success of that effort, the end is so important, and the persons to be reached so numerous and so scattered, that there is room for the wisest and most energetic efforts of the State Board of Agriculture, the State College, and the various local organizations which Prof. Heiges would call into existence, or which, already existing, he would incite to increased activity and efficiency.

Mr. Herr. It has been my experience that there is more than one incentive to labor; that if we throw out sufficient incentives we can find the laborer. The first important incentive to labor has been mentioned by the lecturer of the evening—that scientific research into the subject awakened an inquiry in the mind of a child, and a curiosity to see what is ahead and what is to be learned. That furnishes an incentive to study and to find out in this way something not before known. And young people will travel miles all over the country to investigate and find out what they do not know and what they must go there to ascertain. Another very important incentive to labor is an interest in the business that is being carried on. There are many of us who expect our employés or pupils to labor comparatively for nothing—for somebody else's good. If any of you are raising families, and desire to keep your children on the farm and instruct them in farming duties, give them an interest in some particular direction in the farm, and they will work out the problem and prove not to be lazy. I take the part of the boys and girls, and say they are not as lazy as they are given credit for. Give them work in the direction of the bent of their minds, and it will be found that they are not lazy. That is my experience in what teaching I have done. There are natural inclinations leading them in a certain direction, and in that direction they are not lazy, but diligent, and if they have an inducement to work a thing out they will work a great deal more than we give them credit for. This matter of giving them an interest in some share of stock, or in some part of the cereals growing, and of consulting with them with regard to the management of the farm, is an important thing. Let them understand that they have an interest and they will prove to be industrious.

Mr. **ROLAND.** In the address of Prof. Heiges we have listened to a great many suggestions that have been thrown out, all of them interesting and valuable. But the question in my mind is whether the theory advanced in many of them can be carried out. Generally speaking, all boys are not born to genius. Some of them are very bright, others very dull. I have no doubt but that Prof. Heiges, as a teacher, would discover among his pupils, or perhaps in a family of half a dozen children, that whilst one boy was found very quiet and apt at taking up and understanding almost every branch, yet he would find another who was peculiarly adapted to some particular branch, and, perhaps, he would find still another who was good for nothing at all. I do not rise for the purpose of making any extended remarks, but more particularly to approve the first part of Prof. Heiges' address, with reference to experimental farms. I think it is a valuable suggestion, one that should be considered and acted upon by this Board of Agriculture.

I believe that the Professor should have carried his remarks a little further and established a lecture-room on this experimental farm, where not only young men and young ladies, but older persons, could obtain a knowledge of both analytical and agricultural chemistry. If the time has not already come it will soon come when agricultural societies must look to something higher than they are aiming at now. The people will become tired of going to look at the same old horses, or cows, or the same old coverlet, that they have seen annually for many years at these county fairs. Balloon ascensions, bicycle races, and mule races, are things that, in my judgment, should not be tolerated at agricultural fairs. [Applause.] And I hope the day will come when the agricultural societies will take up just such subjects as have been referred to here to-night for the advancement of agriculture, and for the benefit of society generally, and that the aim of these societies will be higher, not only in agriculture, but, if you please, in the morals of the community.

Mr. **BARNES**, (of Lehigh.) I was very much interested in the remarks of Prof. Heiges, as well as in some others made this evening, and I agree with many of them. These remarks have been of some profit to us, and I think we all will go home from this meeting knowing more than we did when we came.

There was one important statement made by Prof. Wilson, that fixed itself upon my mind as having something to do in connection with the difficulty of getting a young man to go to a farm and work, and that was this: Prof. Wilson says when a young man goes to college to get an education, and we will infer he graduates there, he has a fortune. Where is that fortune? He has not got it in his pocket. No, he has got it in his head, and with that fortune he is able to start out in the world and without any other capital make his way through it. Put a young man on the farm and he drudges and digs there, and what prospect has he before him? If you could hold out an inducement to him by laying down a hundred dollars in twenty dollar gold pieces at the end of every month as a reward for his labor, I will guarantee that you can get young men to labor on your farms. But you cannot do that for the simple reason that the money returns from the farm will not allow such a sum to be paid for labor. If he goes on a farm to work he has nothing to encourage him if he is a poor boy, except his ten or fifteen paltry dollars per month. That is what deters a young man from going upon a farm. If he has that before him as his life vocation, he has very little prospect of accumulating enough to ever own a piece of land. If you can overcome that difficulty you will have no trouble in getting boys to work on a farm.

On the contrary, if a young man has sufficient education to enable him to go out in the world and make, perhaps, his ten or twelve hundred dollars per annum, (for which amount he would probably have to toil four or six years on a farm,) the contrast is too great. Our young men now-a-days are restless and enterprising and look forward to selecting a place where they can make the most money. Unless you can overcome the difficulty these avenues present, where a liberal compensation is obtained for the services rendered, by being shut off to those who seek them in preference to farm labor, it will be a hard matter to rear or obtain young men for the farm. But the time will come, as suggested by Mr. Jordan, I think, when these avenues will be clogged up by a superabundance of young men who seek these vocations that are more easy and profitable. When that is the case, then, perhaps, as a matter of fact, they will have to fall back upon tilling the soil.

Mr. GARRETSON. Mr. President, the many excellent remarks that have been made here this evening have struck me very forcibly, and as there has been some experience-telling here, I hope you will have some forbearance if I tell a little. I have had a great deal of experience in the way of educating boys and men to work. I have been a regular farmer. It has not been said here that we, the farmers, should be the educators, but I think that every one of us who conducts a farm ought to be an educator of his sons and daughters, and of his hired help also. I must say, in truth, that I have never had any trouble to get boys and men to do faithful days' works. I have taken lazy boys who would not work for other men, but who would run away from them, and I have got them to do me an abundance of work, as much as I would ask. Now, I think, that is by studying their nature and disposition. We must look into his nature and disposition and study it thoroughly. We must not drive but we must lead him. The day has come when I do not feel so able to lead as I once did, but, thank God, I have a help at home who is willing to go ahead at this present time.

Now, in regard to the educating of boys, it has been asked here how to educate them. We want them to work with their hands and we want them to work with brains all at one time. We must endeavor to get them interested in their employment. We must instill into them a pride, that disposition that will look forward. Whenever boy or man has done his task to the best of his ability, I would say that it is best never to say anything discouraging to him about it, even if it is not done so well as we would like. I find it a good plan to encourage them when they have done their work, although, perhaps, not done in the best manner, and thus we get them interested in us. Now, I want to say to you, in reference to educating our sons, that I do not consider that I am giving my boys a very liberal book education, although they have the opportunities of our winter schools and summer schools. I endeavor to send two of them to school before harvest, generally. We have an excellent school, and I send them to a select school in summer. I want to tell you how I educate them in farming operations; and there have been some striking illustrations given here in reference to that. I place in their hands teams of horses or mules, such as they can manage. I always keep a watchful eye upon them; give them good implements to work with, and fair, smooth land to work in, and let them go ahead. They, perhaps, propose to do a certain think in a certain way. I ask them, "Won't *that* be better?" They will say, "Well, perhaps it will, papa." After they have done it, they will ask, "Have we done it right?" "Yes, that is very well."

"Is it all right?" "Well, you might have done better so and so." Now, those boys are pleased with that. I give them machinery, and I want to tell you what they did last summer. I bought a Champion mower, and I let my eldest son, who is between eighteen and nineteen, and the second, who is between sixteen and seventeen, manage the machine, except that sometimes I looked to see that it was working right, and now they understand better than I do the working of that machine, and better than the agent—for the agent has acknowledged as much. They must understand it, and then they can work it. In running the machine, if I had ordered them to do thus and so, instead of letting them lead off, they would have been discouraged. We must instill into them a disposition to go ahead; we must put a charge upon them; we must get them to think that they are the rising generation, who will take hold of things, and they will have confidence in themselves. I have always found it just so with hired help. I have never felt the want of hired help, although I have had some that have been driven off from other places. I have now a man living in my tenant house who was discarded from other places for doing things which I shall not mention here, and yet I have found him trusty in many respects. I have talked to him about the matter, and I have reasoned the case with him, and I think he is trying to overcome these things.

Now, in relation to the educating of these boys. I place plenty of reading matter in their hands; I subscribe to agricultural works for them; they have great thirst for the perusal of these agricultural works. Why, sometimes they will go to the post-office, a half a mile, and as soon as the mail comes, one will say, "Let me have that," and another will say, "Let me have that;" and "Here is something that we ought to do." And so on it goes. Now, although I may be wrong, I think that is the plan.

Another stimulant I find excellent: I indulge them to go to the fair, and to fairs in adjoining counties, to see what is there. I want them to feel interested, and I would like to have them exhibit something which will be equally as good as our neighbors', if not a little better. I find they are just as much interested in taking care of the stock in my absence as I am when present. To-night, for instance, I do not feel but that every animal is well cared for, and I have entrusted some valuable stock with a boy sixteen years old, but I am satisfied that he is taking the best of care of it. This is my plan: That we farmers should be the educators; that we must endeavor to get our help interested. I started out with my hands alone, and to depend upon hired help, boys and men, and success has thus far been on my side, and the bright side is still in my eyes. I do not feel any ways discouraged about education. I have made it a study. I have looked forward and have endeavored to study (since I do not need to have much hired help) how to manage these sons, to educate them so as to become good farmers. They say nothing about doing anything else, and in order to have them practical farmers I give them practical works to read, and then I want them to do practical work, and when they do their work I want them to do it in a practical way. I want them to handle stock, and to handle it intelligibly, and in a manner that will do them credit. Just here I will give you an illustration. For instance, one of the boys would get a little boisterous, and I would say, "The neighbors will hear you halloing at those horses; that is not the way." Then he is ashamed of it. Now you cannot hear them unless by chance, when they become excited. Show them where the remissness comes in. I find that in riding with them they are very observing, and it is so with our hired hands. If you talk intelligently to them as best you can, and reason with them as a reasonable man can be reasoned with, it will be found to be the better plan. It is just so with children. I can lead them, but I never had any success in driving them. I can manage one of them better by leading and pointing out incentives than by attempting to drive. We have so many things to attract boys' attention in so many different ways, and it is a very easy matter to study if you just set your heads to work; and I think every farmer in Pennsylvania, especially those who have sons, ought to make it his business to bring up his sons as practical and intelligent farmers.

Col. **FRANK MANTOR.** I am very much interested to-night in this discussion, and it might be said of me as Horace Greeley used to say of himself, when he told what he knew about farming. Now, sir, it is to offer some suggestions, in contradiction of certain statements, and in contradiction of other ideas that have been brought forward to-night, that I rise, and I will not be very long in saying what I have to say.

I was very much interested in the address of Prof. Heiges, but to a portion of that address I take some exceptions. I shall name these suggestions and then suggest to you what, it seems to me, would be, in part, a remedy.

Experimental farming strikes every farmer before me to-night with the idea that it is something which, in a great degree, if brought down to farming interests, means money expended without any very immediate return. I refer more particularly to experimental farming. If it were true, as the gentleman has asserted here to-night, that farms might be established in this State, in every township, if you please, in which the farmer who is employed to conduct such a farm should divide his farm into sections, and raise his different cereals and grains, and then open up, as it were, a general exhibition of the result, every gentleman before me to-night would recognize this fact, that undoubtedly in the end it would be an experiment without any other return than that which would come from the knowledge of the farm itself.

What I would offer here to-night in lieu of that would be this: (I presume, in looking over the house, that there are at least forty agricultural societies represented here,) now, would not this be a better plan: I will speak from the standpoint in which I live. Take the county fair in the county represented here by Capt. Oliver. We have at least five hundred patrons of that fair who employ their time in bringing something for exhibition. We have, I believe, at least two hundred farmers who patronize that fair. How would it be for you gentleman throughout the State, when you get your committees together, to select ten farmers, or twenty, if you please, or thirty, or fifty, or more, and let them do the same thing that the Professor has suggested here to-night? Let them take two acres of land, or five acres, and bring the results of the crops they raise to the fair for exhibition—not wait to spend the money of the State, one, or two, or three hundred dollars to buy a farm, and place some man on it, but let the farmer himself cultivate two acres of potatoes, or two acres of beets, five acres of wheat, or some other grain, and then bring his cereals or whatever it is to the fair for exhibition. For instance, it would be a very easy matter to erect a large shed upon any fair-ground, and have there exhibited what was grown upon Mr. Jones' farm, lying in ——— township, so much from two acres of wheat, and so much of other cereals and plants. Now, it seems to me, that you could get over and surmount the difficulty that has been pointed out here in that way. This looks practical, the other does not.

Some gentleman suggested, if I understood correctly, that it would be a good thing to speak of this matter to the Legislature; and tried to have it understood, as I inferred, that it would be a good thing to get a bill through to get some money out of the Commonwealth. Now, God bless you, let this Commonwealth alone. Do the farming yourself, and let every man be come a Commonwealth himself for this purpose. So much for that suggestion.

Now, in relation to the difficulties of our young men. What is the matter with our young men? Why is it that we have not more young men engaged to-day in farming? I presume that that question can be answered by every man before me. Do you not know, gentlemen, that it is the fact that when you live near a large city, one of the first ideas a boy gets when he gets out of his swaddling-clothes is to dodge into the city? It is so all over the country. It has been my experience in business, and I have done a great deal of it. I have seen boys run wild to get into some speculation.

My friend would like to see two bushels of wheat grown in Dauphin county where there is one growing to-day. It has been true through this Commonwealth, and has been so for years, that the changes taking place in the farms of this State are very great, and it will not be very long before the people of Chester county cannot afford to raise a bullock to send to market when land is so high. If you can go anywhere West and buy land for one dollar and a quarter an acre, and raise cattle, and transport the cattle a thousand miles in the cars to Philadelphia, and then sell them for a larger sum and with less expense than the man who raises bullocks in Chester county; our young men, instead of being confined to the idea of farming these small farms in Pennsylvania, immediately get the idea and hie away to the West.

It is but a few weeks (it was this fall, at least,) since I was invited to tarry a while with a friend at Greensborough, and I was shown more farming land from a certain standpoint in that county than I ever saw before. I saw more farming land in a moment than I had ever before seen, and yet I have traveled over the trackless prairies from one day's end to another without seeing a tree. I saw lands in that county standing edgewise, as it were, and over them and on them were growing crops of every description, and people were interested in them, but it looked to me like a hard way to farm. I assure you, however, those lands were very valuable. But you cannot bring up a boy in that section of the country, where lands are worth from $30 to $150 or $200 an acre, and ever get him to be much of a farmer, when he can pick up his grip-sack and hie away to places where he can buy land for one dollar and a quarter an acre.

The difficulty about placing young men on cheap lands is this: (They are not lazy—there is no such thing as laziness.) It is simply the condition in which they are placed and that is all there is of it. That has been my experience, and I believe I was called the laziest boy in the whole neighborhood, and yet I could out-jump and throw down the next fellow. The difficulty is in giving the boy the occupation he wants to follow. If you think you can make a boy get up and yoke up a pair of old-fashioned stags, such as we used to drive through the country, to some water-mill and bring back his grinding, when it can be done now so much more quickly by machinery, you will make the greatest mistake in the world. Boys are not lazy; there is no such a thing as laziness; I have never seen a lazy man in my life, and I have seen thousands. The mistake is just there. If you will allow your boy to follow the occupation toward which his mind is bent, you will find a brightness and a talent in the young man. I am not one of those persons who believes you can make a farmer out of every boy, because it is not natural. And then there are a thousand things in the way of making farmers, and that is the reason the business seems to drag. A few years ago it required a good many men to make a common mowing scythe; it did not require a great many men to make a hand-rake, but it required time and labor to make an old-fashioned cradle, and I have seen the time when I have hunted the crookedest stick in the woods to make a scythe-snathe. But how is it to-day? The boy gets up, and the father tells him to harness the horses, that he has ten acres to mow, and before night it is done and spread all over the field. Now one boy will do the work that it formerly took ten to do. You have got to devise some other means. It is not true that all boys can be made farmers. You may bring to bear all the science you please, but you cannot always make a farmer of him, because it is not natural.

With these few remarks, Mr. President, I leave the floor. The only reason I had for offering the suggestion at all was to say that in the experimental farming which is to be done in the State of Pennsylvania for the coming year, we ought to resolve before we leave this room not to go to the Legislature to get money, but, according to my plan, divide off your societies with eight, ten, or fifty men, if you please, and let them try to experiment as I have indicated, and let them bring the various products to the fairs, and if you want some one to come down there and lecture on cereals, get Prof. Heiges.

G. HIESTER. My personal experience has been that education does not spoil a boy for work on the farm. When I was quite a small boy, it was understood, between my father and myself, that as soon as I was old enough I should take charge of the farm; and it was also understood between us, that before I entered upon the active duties of life, I should have such an education as a gentlemen's son was entitled to, and as would fit me for the intelligent and successful prosecution of my work. For this purpose, I took a course, in Harrisburg, in the English branches and Latin, and when I was sufficiently advanced, entered the (then) Agricultural College, in Centre county, and in due time graduated, having, while there, paid special attention to the natural sciences generally, and afterwards to their special application to agriculture. And just here is the point I wish to make. The more general scientific knowledge I acquired, and the more theoretical knowledge of Agriculture I acquired while at school, the more anxious was I to get home, and put my knowledge to practice and my theories to the test on the farm. And I think this answers the question asked by Colonel Young a few minutes ago, "How shall we make our boys work?" I say, educate them, and give them such studies as shall cause them to think about the possibilities of their occupation; get their head and heart into the work first, and I will engage it, their hands will not be idle. You never saw a man thoroughly interested in his work or his business, who was not willing to put his shoulder to the wheel and push the work along all the time.

The great trouble is that the majority of boys are taught to hate the very sight of the farm by the fact that they are always being driven to the most disagreeable and laborious work. Is it natural to suppose that a boy will naturally fall in love with a farmer's life, when his entire time is occupied cleaning cow stables; thinning corn by himself, in a ten or twenty-acre field; hoeing corn or potatoes with an old rusty hoe, and being obliged to keep up with the hired man, who is furnished with a nice bright one; turning the grindstone at noon, to sharpen several scythes or reaper knives, as the case may be, while the men sit around in the shade and take their nooning; then, without a minute's rest, be obliged to carry sheaves, or work in the hottest part of the mow, through the heat of the afternoon; and, between loads, run to the pump and get water for the men, who sit and rest themselves while he runs their errands? What can be more unreasonable than to suppose that a boy who passes through such an experience will ever want to be a farmer? Yet this is the experience of almost every boy on the farm. He is taught that labor is honorable, and the more work he can do in a day the more honorable he is. From his experience, he is led to believe that the lot of a farmer is to rise before five in the morning; work hard all day, till darkness puts an end to his work; then go to bed, and get rest and strength for another day's work. He is taught that if he pursues this course from the time he is fourteen years old until he is fifty, he will probably, if he has good luck, own a farm of one hundred and fifty or two hundred acres. Is there anything inviting in this prospect?

I tell you, if you fathers want to keep your boys on the farm, you must change your tactics as mine did, teach your boys that money is not the only desirable object to work for, that the greatest satisfaction and the most comfort and happiness is not to be obtained by spending your whole life in the work of amassing a fortune for your heirs to quarrel over after you are dead. You must get this notion of boys working out of your heads, although we badly need workmen, and although every year this need is more felt, yet the greatest need of the agriculturist in the eastern States to-day, is *farm managers.* Don't try to force your boys to work that is disagreeable to them; lead them to love the farm by showing them that if they will manage properly, they will have pleasanter, easier work than the railroader, or the poorly-paid, closely-confined, store-clerk or book-keeper; that their farm, with proper management, will enable them to live like gentlemen, and as they grow older, they will be able, each year, to have more comforts and more leisure for mental and social enjoyment than can be obtained in the pursuit of any other profession; that if they use their leisure hours in the improvement of their minds, they can always stand in the first rank of society.

If I for one instant believed that a farm afforded no more possibilities for social enjoyment, mental growth, and the possession of such comforts and luxuries as money alone can buy, than are obtained by the average farmer of to-day, I would not remain on the farm an hour, and never would have chosen agriculture as my business. But I firmly believe, and every year that belief is strengthening, that no occupation affords as great advantages for the enjoyment of life in the true sense of the word as agriculture, and in order to enable our boys to get all the good out of it, we must educate them liberally.

C. C. **MUSSELMAN**, of Somerset. I am generally considered conservative, but on the subject of industrial education, I accept almost anything that has a tendency to develop the whole man, both physically and mentally. I am almost willing to go with Professor Heiges and his industrial education to every school-district, if he was willing to modify his plan a little. My sentiments on this subject are pretty well known to this Board. I shall never forget the flattering compliment and timely encouragement that Professor J. P. Wickersham gave us, when I expressed myself upon this topic at a former meeting. After giving his views and what he saw of industrial education in Europe, he said, (speaking of introducing industrial education into our schools,) "*I will fight it out on that line, if it takes my lifetime.*"

There is more truth than poetry in what Colonel Young has said upon this subject. We don't want less education, but *we want more of it on the farm and in our workshops.* Our system of educational training puts everything in the *head* and nothing in the *heel.* Instead of encouraging a full grown gigantic manhood, physically and mentally, our present fashionable anti-industrial educational training has a tendency to deteriorate us into a nation of cronic dyspeptic invalids. I hope the day is not far distant when the healthful, useful, and honorable exercise and labor will join hands with education and lift us to a higher plane.

REPORT OF THE COMMITTEE ON FORESTS AND FORESTRY.

By W. S. ROLAND, *Chairman.*

Read at the Spring Meeting of the Board.

In the preparation of a report on a subject so varied and extensive as the one which has been referred to your committee, many suggestions, declarations, and statistics, may be embraced which are not new, and much of it may be only a repetition of what has often heretofore been said and written.

The resources of the State are invaluable, and the people generally are intelligent, persevering, and prosperous; ever on the alert in active industry and boldness of enterprise, and in the pursuit of valuable knowledge, they are well calculated to take care of their own interests as well as to advance the general welfare of the Commonwealth. They are governed and protected by good and wholesome laws, and have most excellent opportunities for pursuing scholastic attainments in the various professions, arts, tastes, and occupations, all of these studies so important and absolutely necessary to a successful economy of human existence; and thus whilst it can be proudly said of our people that they surely are on the high road to prosperity and a safe future, it must not be forgotten that in all departments of industry there are often serious drawbacks which are sure to come sooner or later, but which may be averted in time if the necessary precautionary means are brought into timely use, and perhaps the foremost and most serious of these drawbacks will be found in the great demand, as well as in the rapid destruction, from various causes, of the large timber areas throughout the State. This great demand, and too often absolute waste, is getting to be a growing evil, and the people may well stop and think over it, for unless there is greater care and better protection in meeting these demands on our forests, by encouraging and increasing forest growth, they will see that at no distant day the trees will be gone, the demand increased, occupations lessened, and the people suffering for want of that employment and protection which the forests alone can give.

The vast and increasing importance of this subject, the value and necessity of caring for the timber of the State, may well be classed in that list which requires close observation, careful investigation, and reliable statistical information, on which to base a satisfactory report.

The fact of the rapid deforestry of large areas, and the expression of fears of a possible timber famine in the near future, is beginning to enlist the fears and excite the attention of the people. As the population increases, business of all kinds advances, and this is, perhaps, more particularly noticed in our manufacturing operations than in any other branch of industry; and to meet these demands at home and abroad, suitable timber in large quantities is all the time needed, and, as a matter of course, it will all the time be getting scarcer and dearer, thus requiring much effort, time, and care, with judicious management in promoting forest culture. To meet these constant demands for the supply of wood, it is confidently hoped that experimental experience in forest culture will in time teach the people that it can be made as remunerative as any other branch of industry, and that they will ultimately learn that we can produce our wood and timber supplies as surely and profitably, though with not so frequent harvests, as we can grow our grain and meat supply.

All kinds of trees can be utilized, and hence, in forest culture, the people should know which kinds can be best and most profitably grown in certain soils and localities. Investigations leading to the fullest development of the resources of the State, in the business of forestry should be encouraged, and the necessary aid should be proffered for the discovery of the best method of management, and for the protection and preservation of our wasting forests; for there are few subjects so closely connected with the wants of society, the general health of the people, the salubrity of our climate, the production of our soils, and the increase of wealth, as our forests afford. Therefore, entertaining and acting on the views as herein expressed, the committee had printed about three hundred circulars, and mailed from three to five copies of the same to various parties, in every county of the State. The following is a copy of that circular:

1. How much old timber is there in your county? 2. How much young timber to replace the old? 3. What kinds grow best? 4. What kinds are most in demand? 5. What soils are best adapted to certain kinds? 6. Can the cultivation of timber be made profitable? And please give your experience and opinion in forest culture. 7. Would the introduction of varieties from adjoining counties or States, or from other countries be of profit to your locality? If so, what kinds do you consider the best to introduce? 8. What do you consider the best protection against forest fires? 9. To what extent have the people of your county taken advantage of the law providing for the planting of trees along the highway? 10. What kind of legislation do you deem best adapted to the needs of the case?

The committee would request that you make your answers to these queries as full as you can, and that you refer therein to the queries by the number here given.

Respectfully, on behalf of the committee,
W. S. ROLAND,
Chairman.

Over one hundred correspondents throughout the State returned answers to the above questions, from which the following extracts and deductions are made. NOTE.—When there is more than one report from a county, it is indicated by *.

QUESTION 1.—How much old timber is there in your county?

ADAMS—One fourth. **ALLEGHENY**—One tenth. **ARMSTRONG**—Two fifths. **BEAVER**—From one tenth to one fifteenth. **BEDFORD**—One tenth. **BERKS**—About one twentieth. **BLAIR**—One fourth. **BRADFORD**—One fifth. **BUCKS**—One sixth. **BUTLER**—From one sixth to one tenth. **CAMBRIA**—Not over one seventh of the original growth. **CAMERON**—Not reported; estimated at more than one half. **CARBON**—Not reported; estimated at more than one third. **CENTRE**—About ten per cent. of original growth. **CHESTER**—Less than one acre in 500 acres of general area. **CLARION**—Not reported; estimated at one fourth of area. **CLEARFIELD**—Not reported; estimated at one third of area. **CLINTON**—

Estimated at one sixth of the area of the county. Columbia—Estimated at one third of the area of the county. Crawford—From one fifth to one tenth. Cumberland—About one tenth. Dauphin—Estimated at one fifth. Delaware—About one sixth. Elk—About one half. Erie—From ten to fifteen per cent. Fayette—Average about one third of the original growth. Forest—One half of the county. Franklin—One fourth, including mountains. Fulton—Not reported; estimated about one third. Greene—Probably one fourth. Huntingdon—About two fifths. Indiana—Will average one third. Jefferson—Nearly one half. Juniata—Nearly one third. Lancaster—About one tenth. Lawrence—From fifteen to twenty per cent. Lebanon—About one third. Lehigh—About one fifth. Luzerne—Average about one third. Lycoming—Average about one third. Lackawanna—Not estimated; reporter says the timber has been slaughtered. McKean—From one half to two thirds of the original forest. Mercer—Supposed to be less than one fourth. Mifflin—Probably one fourth. Monroe—Not reported; estimated at one third. Montgomery—About one thirtieth. Montour—About one eighth. Northampton—About one thirtieth. Northumberland—About one twelfth. Perry—Estimated at one fifth. Philadelphia—About one hundred acres in the whole county. Pike—Very little of the original growth. *About 50,000 acres of pine. Potter—Three fourths. Schuylkill—Not reported; estimated about one fourth of the area. Snyder—One third of the land of the county. Somerset—About one third. Sullivan—About one half. Susquehanna—About one third. Tioga—Estimated one third. Union—Estimated one fifth. Venango—Estimated one third. Warren—About one third. Washington—Ten per cent of area. Wayne—Estimated at about one fourth. Westmoreland—About 135,000 acres. *About ten acres in every one hundred. Wyoming—About one third. York—About one fifth.

QUESTION 2.- How much Young Timber to replace the Old?

Adams—Considerable sprouting of young timber. Allegheny—None planted. Armstrong—Sufficient growing. Beaver—Very little. Bedford—Scarcely any. Berks—Twenty-five per cent. of the area of old timber. *Chestnut, with some little white oak, will be our only supply. Blair—About three eighths of the square miles in the county. Bradford—Only a very small amount. Bucks—Very little. Butler—About one twenty-fifth per cent., to take the place of the old timber. Cambria—Considerable young chestnut and locust sprouts. Centre—About forty per cent. *There is considerable mountain land in young timber, but fires destroy it every few years. Chester—About seventy-five per cent. of stump land is allowed to grow up in timber. *Probably one acre to every ten of plowed land, and consists mostly of chestnut. Clinton—Probably one tenth of the area of old timber. *None except the natural growth. Columbia—Very little. Crawford—None worth mentioning. Cumberland—None. *As much growing as being cut. Dauphin—None but mountain sprouts. Delaware—One per cent. Elk—None worth mentioning. Erie—None, or very little. Fayette—None of any account. Forest—About one fourth of the timber area. Franklin—None, except on mountains. Greene—Little of value. Huntingdon—None, except what springs up spontaneously. Indiana—None, except what springs up spontaneously. Jefferson—Very little, or none. Juniata—None in the valleys; some spontaneous growth on mountains and ridges. LANCASTER—Very little. LAWRENCE—None. LUZERNE—Not any. LEBANON—Inclose and protect the sprouts from cattle, and time will replace it. LYCOMING—Some young timber growing with the old in some places. LACKAWANNA—Very little. McKEAN—None of any amount. MERCER—If left to grow, time would replace the old. MIFFLIN—Considerable on the mountains. MONTGOMERY—None. MONTOUR—About one eighth of the timber area. NORTHAMPTON—Very little. NORTHUMBERLAND—Some chestnut sprouts. PERRY—None, except spontaneous growth. PHILADELPHIA—None. PIKE—There is some; cannot tell how much. POTTER—None. SNYDER—About one ninth of old timber area. SOMERSET—Only to a limited extent. SULLIVAN—About ten per cent. growing up again. SUSQUEHANNA—None planted. TIOGA—None, or little to supply future demand. UNION—None, or very little. VENANGO—As much as there is old. WARREN—There is a little young timber, about five per cent. WASHINGTON—Very little. WAYNE—Considerable. WESTMORELAND—None in settlement; considerable young chestnut on the ridges. WYOMING—Very little, about one tenth of old timber area. YORK—About one twentieth, chiefly young chestnut and locust.

QUESTION 3.—What kinds grow best?

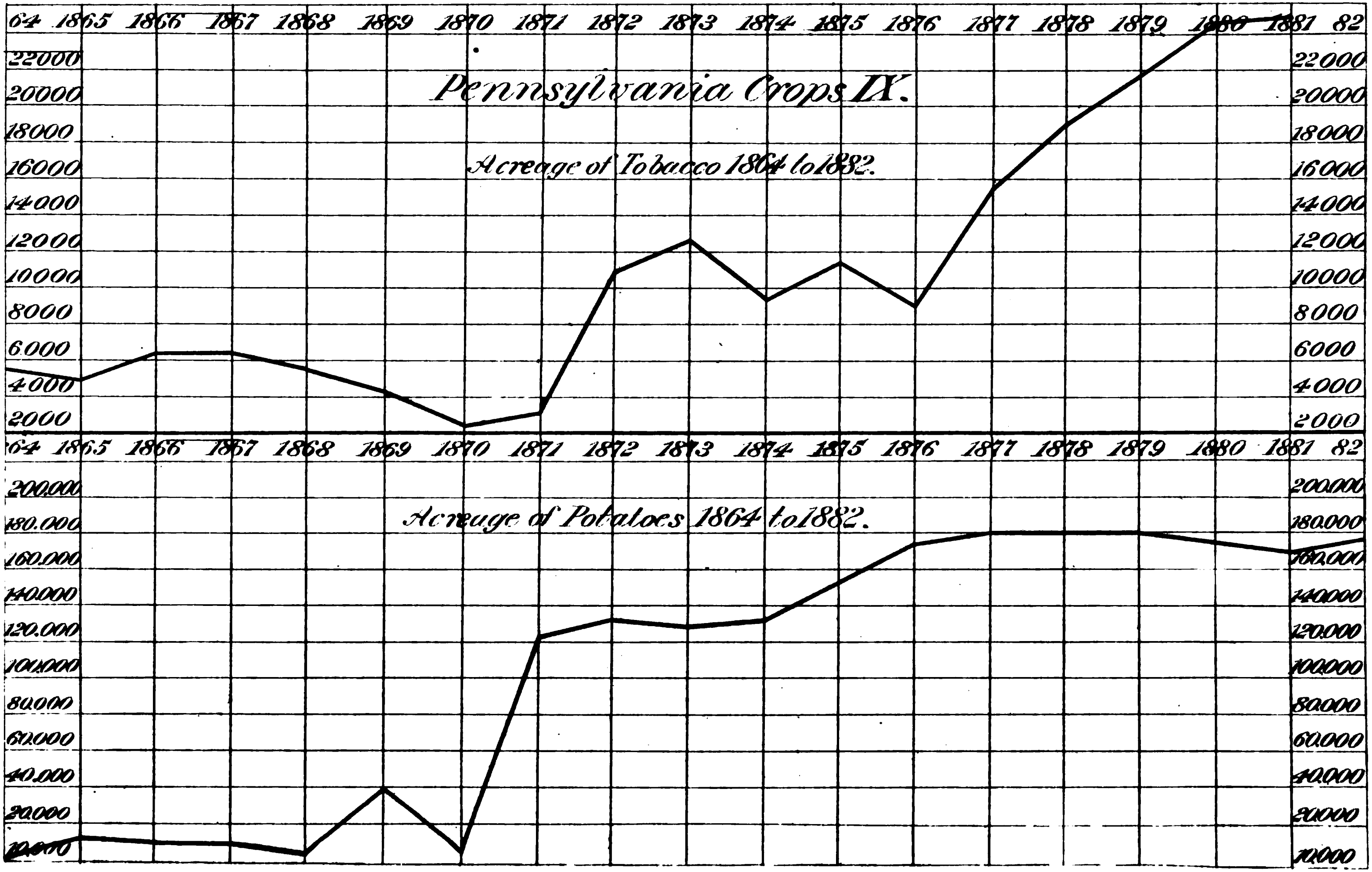
COUNTIES.	White oak.	Black oak.	Rock oak.	Oak.	Chestnut.	Hickory.	Black walnut.	Locust.	Pine.	Hemlock.	Ash	Poplar.	Beech.	Maple.	Elm	Bass.	Other varieties.
Adams,	0		0		0	0		0									
Allegheny,	0					0	0	0			0			0	0		
Armstrong,				0	0												
Beaver,	0							0						0			
Bedford,	0				0			0			0						
Berks,	0				0	0			0					0			
Blair,	0		0	0	0			0									
Bradford,				0	0	0			0	0			0	0		0	0
Bucks,	0				0	0					0	0		0			
Butler,	0			0	0	0	0				0						
Cambria,				0	0				0	0	0			0			
Centre,				0	0	0		0	0								
Chester,	0	0			0	0	0	0					0				
Clinton,					0				0	0							
Columbia,				0	0												
Crawford,				0	0	0			0	0	0	0	0	0	0		0
Cumberland,	0	0	0		0	0			0								
Dauphin,					0			0									
Delaware,				0	0	0		0									
Elk,									0					0			
Erie,				0	0	0	0		0	0	0	0	0	0		0	0
Fayette,				0	0		0	0				0					
Forest,					0					0	0	0					
Franklin,				0	0	0	0	0									
Greene,				0			0	0				0					
Huntingdon,	0				0			0	0	0				0			
Indiana,	0			0	0	0	0		0	0							
Jefferson,	0				0		0		0								
Juniata,				0	0	0	0										
Lancaster,					0			0						0			
Lawrence,	0	0		0	0	0					0	0	0	0			
Lebanon,	0		0		0	0	0	0									
Luzerne,										0							
Lycoming,				0		0	0										
Lackawanna,				0	0	0	0			0				0			
McKean,				0		0			0				0	0			
Mercer,				0	0				0	0	0		0	0			
Mifflin,					0	0		0	0					0			
Montgomery,	0	0		0	0												
Montour,				0	0												
Northampton,	0	0	0		0	0	0										0
Northumberland,	0				0												0
Perry,	0		0			0	0	0									
Philadelphia.																	
Pike,				0	0				0	0			0	0			
Potter,				0	0				0	0	0		0	0			0
Snyder,				0	0												
Somerset,				0	0	0			0	0				0			
Sullivan,					0				0	0	0		0	0			0
Susquehanna,					0					0	0		0	0			
Tioga,				0	0				0	0			0	0			0
Union,	0	0			0			0	0					0			
Venango,	0			0	0									0			
Warren,				0	0				0	0	0						
Washington,	0					0						0					
Wayne,						0		0	0	0	0		0	0	0		
Westmoreland,	0	0			0	0	0	0			0	0		0			
Wyoming,				0	0	0				0			0	0			
York,	0		0		0	0	0	0									0

QUESTION 4.—What Kinds are Most in Demand?

COUNTIES.	White oak.	Black oak.	Rock oak.	Oak.	Chestnut.	Hickory.	Walnut.	Locust.	Pine.	Hemlock.	Ash.	Poplar.	Beech.	Maple.	Elm.	Bass.	Other varieties.
Adams,			0		0	0		0									
Allegheny,	0					0	0	0									
Armstrong,				0	0				0								
Beaver,	0							0	0								
Bedford,	0				0			0									
Berks,	0			0	0												
Blair,				0	0			0	0	0							
Bradford,					0				0	0							
Bucks,	0				0	0	0				0	0					
Butler,	0				0	0			0								
Cambria,	0				0				0	0	0			0			0
Centre,	0				0		0		0	0							
Chester,	0			0	0	0	0										
Clinton,					0		0		0								
Columbia,	0				0				0	0							
Crawford,				0	0				0	0	0	0	0	0			
Cumberland,	0				0	0			0								
Dauphin,	0				0				0								
Delaware,	0				0	0		0									
Elk,									0	0	0	0					
Erie,				0	0	0	0			0	0		0	0			0
Fayette,				0			0	0				0					
Forest,				0					0								
Franklin,	0		0			0	0										
Greene,				0			0	0				0					
Huntingdon,	0		0	0	0	0	0	0	0	0	0	0					
Indiana,	0			0	0	0	0		0	0							
Jefferson,				0	0		0		0								
Juniata.					0						0						
Lancaster,					0			0									
Lawrence,	0			0	0	0			0		0						
Lebanon,	0	0			0	0	0	0									
Luzerne,					0				0	0							
Lycoming,									0								
Lackawanna,				0	0	0	0		0	0							
McKean,										0	0		0				
Mercer,				0													
Mifflin,				0	0	0			0					0			
Montgomery,	0				0					0							
Montour,					0												
Northampton,	0	0			0	0	0										
Northumberland,	0				0												
Perry,	0				0	0											
Philadelphia.																	
Pike,				0	0				0	0							
Potter,						0			0	0	0						
Snyder,				0					0								
Somerset,					0					0	0						
Sullivan,					0				0	0	0			0		0	
Susquehanna,										0							
Tioga,				0	0				0	0	0						
Union,	0		0		0				0								
Venango,	0				0												
Warren,				0	0	0			0	0	0						
Washington,	0					0			0			0					
Wayne,					0				0	0	0		0	0			
Westmoreland,	0					0	0	0									
Wyoming,				0	0	0			0	0						0	
York,	0		0		0	0	0	0	0	0		0					0

QUESTION 5.—What Soils are best Adapted to certain Kinds?

ADAMS—Low clay for white and rock oak, high gravel for chestnut. ALLEGHENY—Our soils are adapted to the growth of all kinds, except pine and hemlock. ARMSTRONG—Low land for oak; upland for chestnut. BEAVER—Clay for oak, high land for locust, and rather wet and sandy for pine and maple. BEDFORD—Heavy soil for white oak; light and sandy for chestnut and locust. BERKS—Heavy clay for hickory and oak, and a



Pennsylvania Crops IX.

Acreage of Tobacco 1864 to 1882.

Acreage of Potatoes 1864 to 1882.

light soil for chestnut. **BLAIR**—Gravel and black slate for chestnut, locust, and oak. **BRADFORD**—Shales. **BUCKS**—Deep clay for white oak and hickory; gravelly for chestnut. **BUTLER**—Sandy loam for hickory and chestnut; clay for ash and walnut. **CENTRE**—Sandy and slate for pine, and chestnut, and locust; limestone and rich table land for oak, hickory, and walnut. **CHESTER**—Rich table land for hickory, walnut, and oak; slate and gneiss for chestnut. **CLINTON**—Light mountain for white pine and chestnut; limestone for oak, hickory, and walnut. **COLUMBIA**—Chestnut on the ridges; pine, hemlock, and oak in the lowlands and swamps. **CRAWFORD**—Gravel, loam, and clay subsoil for oak, chestnut, beech, and maple; lowlands of deep alluvial character for pine, bass, cucumber, &c. **CUMBERLAND**—Limestone for oak, hickory, and locust; gravel for pine and chestnut. **DAUPHIN**—Mountain soil for chestnut and locust. **DELAWARE**—Light soil for chestnut; heavy rich for locust and walnut. **ELK**—Any soil not wet. **ERIE**—Clay bottom for oak, hickory, walnut, and hemlock; gravel and sand for chestnut, maple, poplar, and cucumber. **FAYETTE**—Rich loams for walnut, locust, and poplar. **FOREST**—Clay and hard-pan for oak and pine; limestone for white oak. **FRANKLIN**—Limestone and black slate for white and rock oak, hickory, and walnut; sandy for chestnut. **GREENE**—Heavy clay for oak, and loamy for walnut and poplar. **HUNTINGDON**—Clay and limestone for oak; mountain ridges for rock oak, chestnut, and locust; low, rich land for walnut and all other kinds. **INDIANA**—Heavy soil for oak, walnut, and hickory; gravel and sand for chestnut and pine. **JEFFERSON**—Rich loam for walnut and white oak; light for chestnut; any soil for pine. **JUNIATA**—Sandy for chestnut; limestone and clay for other kinds. **LANCASTER**—That depends on the kind of timber. **LAWRENCE**—Clay for the oaks; gravel for chestnut; rich loam for walnut; moist bottom for pine, maple, &c. **LEBANON**—Limestone for oak and walnut, and hickory; gravel for chestnut; sandy for locust. **LUZERNE**—Clay for growth of our timber. **LYCOMING**—Our soil is adapted to all kinds. **LACKAWANNA**—Mountain soil for oak and pine; bottom lands for white ash, walnut, hickory, &c. **MCKEAN**—Soil makes no difference. **MERCER**—High and gravelly for oak and chestnut; low clay and sand for hemlock and maple. **MIFFLIN**—Sandy for pine, chestnut, locust, and oak; limestone clay for hickory. **MONTGOMERY**—Slate hills for chestnut; clay soils for oaks. **MONTOUR**—Gravel for chestnut; clay for white oak. **NORTHAMPTON**—Clay and limestone for white oak, hickory, and walnut; gravel and slate for chestnut, and pine, and maple. **NORTHUMBERLAND**—Uplands for chestnut; side hills for white oak and spruce. **PHILADELPHIA**—No report. **PERRY**—Gravel and limestone for walnut, chestnut, oak, and locust; bottom lands for hickory. **PIKE**—What we call beech soil. **POTTER**—Not any especially distinct from other kinds. **SNYDER**—Light for chestnut; heavy for oak. **SOMERSET**—Clay for oaks; sandy for chestnut; wet and sandy for pine. **SULLIVAN**—Dry, rolling ridges for hard wood; low, murky for hemlock. **SUSQUEHANNA**—Clay sub-soil for hemlock, maple, chestnut, ash, &c. **TIOGA**—Mountainous for pine; swamp for ash; table land for maple and beech. **UNION**—Clay bottom for oaks; any good soil for chestnut and locust. **VENANGO**—Clay, gravelly loam for chestnut, oak, and other varieties. **WARREN**—High and rolling for the oaks, maple, and bass; low and swampy for ash, &c. **WASHINGTON**—Clay and limestone for most thrifty timber. **WAYNE**—Low lands for pine and hemlock; high lands for hard wood. **WESTMORELAND**—Any limestone and sandy soil for oak, walnut, and locust. **YORK**—Limestone and clay for oaks, hickory, and walnut; sandy and slate for locust, chestnut, and pine.

QUESTION 6.—Can the cultivation of Timber be made profitable?

Adams—No. Allegheny—Yes; locust and maple. Armstrong—No. Beaver—Yes; locust and maple. Bedford—Think it can. Berks—Not in this; experience none. * Chestnut might be. Blair—It can if measures are devised to protect it from fires. Bradford—It can. Bucks—Think it could to a certain extent. * Think not, as it is of such slow growth. Butler—Yes; chestnut, hickory, and locust. Centre—Think not, as we have an abundant supply, and taxes are too high. Chester—Yes; if there is a will to plant and nurse young trees; there are plenty of tulip poplars and chestnuts, and other trees known to me that are valuable. Clinton—Not, except it be chestnut or locust. Columbia—Have no experience. Crawford—Think not; the native varieties properly cared for could be made profitable. Cumberland—Our limestone land is too high-priced to appropriate for that purpose. Dauphin—Cannot answer. Delaware—Think not; our lands are too high-priced. Elk—No. Erie—I venture to say it could be. * Not so long as other places furnish cheap lumber. Fayette—Think locust and walnut would pay. Forest—Cannot say, as we have plenty. Franklin—Think not. Greene—Think not. Huntingdon—Do not think it could. * It can; speak from experience. Indiana—Exceedingly doubtful. * It could be, particularly walnut. Jefferson—In my opinion it can; white pine, chestnut, and black walnut grow very rapidly, and their annual growth would yield a good percentage. Juniata—It would not. Lancaster—Not in our county, where land is so high-priced. Lawrence—Cultivation of locust and chestnut could be made profitable. Lebanon—Chestnut and locust can be made profitable, because of their rapid growth. * Certainly, and the time is at hand, when necessity, as well as profit, will stimulate its culture. Luzerne—Do not think it could be. Lycoming—Think not, as timber is too cheap in the north-west. Lackawanna—Think it can; have cultivated sugar maple and walnut with success. McKean—It could be if protected against fires. Mercer—No experience. Mifflin—Think locust could be. Montgomery—Think not. Montour—No experience. Northampton—No experience. * Locust and walnut, in my opinion, can. Northumberland—It can where land is not too high priced. Perry—Think not. Philadelphia—No report. Pike—No; our population is too much scattered, and fires too destructive. Potter—Has not been tried. Snyder—It cannot. Somerset—Yes; decidedly; maple, locust, and walnut have been grown successfully. Sullivan—Think it can; have some experience in walnut and chestnut. Susquehanna—No; not yet. Tioga—No. Venango—No. * Think it could. Warren—It can, and speak from experience. Washington—No, sir. Wayne—It can, for I know it from observation and experience. Westmoreland—It might, through the aid of legislative action. Wyoming—Think it can; have some experience with locust and sugar maple. York—It can.

QUESTION 7.—Would the Introduction of other Varieties be Profitable?

To this question nearly all of the correspondents return a negative answer. The few exceptions are, that possibly walnut, locust, chestnut, oak, hickory, and pine, in the order in which I have named them, could be introduced and grown with profit.

QUESTION 8.—What do you consider the best Protection against Forest Fires?

Adams—A reward for the arrest and conviction of offenders. Allegheny—A law making it a penal offense to shoot game in the forests during a season of great drouth. ARMSTRONG—A good shower of rain. BEAVER—Clear away the underbrush, grass will spring up, then pasture with sheep. * Plowing around the inclosure, and sowing in grass. BEDFORD—Fire from railroad engines are the most annoying; there should be a law to punish railroad companies for all damage done. BERKS—Have some better restrictions on railroad companies. * County commissioners to appoint persons to put out fires, and pay them. BLAIR—The appointment of a competent wood-ranger or forester to each township, who shall have power to employ help when fires happen. BRADFORD—Organizations of able-bodied men to put the fires out. * Burn away the leaves and underbrush, then fires will not do much injury. BUCKS—We have no forest fires. BUTLER—We are not much troubled with forest fires. CAMBRIA—Stringent laws with heavy penalties. CENTRE—Remove the underbrush from amongst the timber. * Proper restraint on railroad companies, and punish individuals. CHESTER—Require railroad companies to clear at least two perches in width beside their roadway, and get rid of all the tramps. CLINTON—Land cleared from railroads; proper legislation. COLUMBIA—The fire from locomotives is invariably the cause of fires in this county. CRAWFORD—Railroad locomotives are the principal sources of danger, and farmers burning brush, and careless huntsmen. CUMBERLAND—Very stringent laws. DAUPHIN—Watchfulness on the part ot landholders. DELAWARE—No fires in this section. ELK—Nothing to recommend. ERIE—Not troubled much. FAYETTE—Vigilance, and work to put them out. FOREST—Shoot the aggressor. FRANKLIN—Punish offenders. GREENE—A law making the owner of premises from which the fire escapes responsible for damages. HUNTINGDON—Watch it closely, and put it out before it gets headway. INDIANA—The enforcement of the law for protection of timber. * Hang the tramps. JEFFERSON—Remove from the ground all combustible materials on which fires feed. JUNIATA—No plan to suggest. LANCASTER—Not much trouble with them. LAWRENCE—Pray for rain. LEBANON—A law authorizing the county to appoint three watchers in each township, a vigilance committee, with plenty of rope to hang every incendiary. * Greater care in having spark arresters on railroad locomotives. LUZERNE—Hard to answer. LYCOMING—Greater care on part of railroad companies, and removal of rubbish from road sides. LACKAWANNA—A vigorous prosecution of the law. McKEAN—A law making persons liable for damages caused by building fires in the woods; also hold railroad companies liable for fires caused by locomotive sparks. MERCER—Sensible people and plenty of rain; law penalties might help. MIFFLIN—Divide timber land into small tracts, and owners guard it. MONTGOMERY—Not troubled with them. MONTOUR—Stop sportsmen from hunting, and compel railroad companies to pay all damages done by them. NORTHAMPTON—Carry out the laws better, and there will be less fires. NORTHUMBERLAND—No protection would be needed if the sparks from railroad engines did not cause the fire. PERRY—Heavy penalty laws. PHILADELPHIA—No report. PIKE—Clearing the land surrounding the woods. * Severe punishment for tie stealers. POTTER—Great care in putting out and keeping fires under control. SNYDER—Have spaces cleared in the woods. SOMERSET—Make wide roads through timber lands. * Stringent laws, and have them enforced. SULLIVAN—Put the laws in force, and if not severe enough, enact others. * More stringent laws against burning underbrush when clearing land. SUSQUEHANNA—Protection from sparks of railroad engines, and a less use of matches. * The hangman's rope. TIOGA—Honesty; for the lack of it, a statute with a severe penalty. * Continuous wet weather. **UNION**—A still more stringent law; and prevent deer-hunting with dogs. **VENANGO**—Stringent laws, and better protection from railroad locomotive sparks. **WARREN**—Clean ground, eternal vigilance, and plenty of water. **WASHINGTON**—Not troubled with them. **WAYNE**—The statute law passed in 1879. **WESTMORELAND**—Keep the ground clean of leaves. **WYOMING**—Greater care, and a stricter enforcement of the laws. **YORK**—Better security against locomotive sparks, and from hunters and tramps.

QUESTION 9.

A very large number of the correspondents in answer to this question, report that no trees have been planted along the highways, whilst a few others report that the law is observed only to a very limited extent. The conclusion, therefore, is that the law is not generally known, or if known, is not obeyed.

QUESTION 10.—What Legislation is Required?

This question, judged by most of the answers, does not seem to have been properly understood by many of the correspondents. We extract the following from some of the replies, without designating counties:

"England has a law governing the case, why not copy it?" "We have too much legislation not enforced." "A general act to prevent cattle from running at large." "A reduction on road tax." "Exempt all well-kept timber lands from taxation." "We are not yet ready to adopt the European system of forest laws." "Adopt a good forestry law." "Do not think any legislation necessary." "Make it a criminal offense to turn out cattle to browse." "A premium for planting and cultivating trees." "Laws encouraging the planting of trees." "Require county commissioners to publish in the county papers all laws now in force, relating to the subject," &c.

List of Contributors with their Post-Office address.

ADAMS—E. Maginly, Fairfield. **ALLEGHENY**—John R. McMichael, Beach Cliff. **ARMSTRONG**—S. Hamilton, Oakland. **BEAVER**—John Dillon, New Gallilee; J. S. Elder, Darlington. **BEDFORD**—W. C. Lutz, Bedford. **BERKS**—F. B. Hassler, Hamburg; J. G. Zerr, Geiger's Mills. **BLAIR**—John A. Lemon, Harrisburg. **BUCKS**—David McNair, Richboro'; Eastburn Reeder, New Hope. **BUTLER**—A. D. Weir, Freeport; James D. Lytle, Harmony; J. P. Robinson, Glenora. **BRADFORD**—James Macfarlane, Towanda; A. T. Lilley, Le Roy. **CAMBRIA**—John Beaver, Carroltown; Alva Akers, Johnstown; J. P. Stalb, Grant; James J. Kayler, Ebensburg or Loretto. **CENTRE**—D. Weiland, Linden Hall; J. A. Hunter, State College; John Hamilton, State College. **CHESTER**—W. R. Shelmyer, Avondale; Dr. John P. Edge, Downingtown. **CLINTON**— —— ——, North Bend; J. A. Herr, Cedar Springs. **COLUMBIA**— —— ——, Buckhorn. **CRAWFORD**—J. S. Kean, Evansburg; A. N. Perrin, Titusville. **CUMBERLAND**—Hon. Fred'k Watts, Carlisle; G. R. Dykeman, Shippensburg. **DAUPHIN**—Henry Hartman, Berrysburg. **DELAWARE**—Thomas Speakman, Brandywine Summit. **ELK**—John C. McAllister, Brandy Camp; J. W. Gray, Benezette. **ERIE**—J. Miles, Milesgrove; William M. Brown, Erie. **FAYETTE**—William Beesom, Uniontown. **FOREST**—W. P. Siggins, West Hickory. **FRANKLIN**—John Webster, Mercersburg. **GREENE**—B. H. Clark, Waynesburg. **HUNTINGDON**—S. McVittey, Saltillo; C. Wakefield, Allenville; R. McDevit, Huntingdon; Livingston Robb, McConnellstown. **INDIANA**—George W. Hood, Indiana; W. T. Work, Brady; P. M. Hodge, Blairsville. JEFFERSON—J. B. Conser, Punxsutawney; ——— ———, Brookville. JUNIATA—W. Banks, Mifflintown. LANCASTER—Johnson Miller, Litiz. LAWRENCE—J. M. Lawrence, Plain Grove; H. C. Falls, New Castle. LEBANON—A. Wilhelm, Cornwall; George W. Kline, Lebanon. LUZERNE—John B. Smith, Kingston. LYCOMING—M. P. Hepburn, Jersey Shore. LACKAWANNA—J. D. Cramer, Carbondale; ——— ———, Ransom. MCKEAN—C. Smith, East Valley; D. Sampson, Jr.. Turtle Point. MERCER—Samuel Coleman, Centreton. MIFFLIN—Joseph Campbell, Belleville. MONTGOMERY—William H. Holstein, Bridgeport. MONTOUR—L. L. Sechler, Danville. NORTHAMPTON—J. J. Ealer, Easton; A. D. Shimer, Bethlehem. NORTHUMBERLAND—J. F. Derr, Sunbury. PERRY—D. B. Milliken, Landisburg. PHILADELPHIA—Thomas Meehan, Germantown. PIKE—E. J. Baker, Milford; William Cromwell, Hawley. POTTER—J. W. Allen, Coudersport; J. E. Harvey, West Bingham. SNYDER—Philip Hilbush, Selinsgrove. SOMERSET—J. W. Hay, Elk Lick; John W. Beachy, Elk Lick; C. C. Musselman, Somerset. SULLIVAN—Benjamin Vaughn, Sciota Vale; Lyman B. Speaker, Hillsgrove; Richard Bedford, Campblesville. SUSQUEHANNA—John C. Morris, Friendsville; L. T. Birchard, Birchardville. TIOGA—Lafayette Gray, Mainsburg. UNION—John R. Follmer, Allenwood. VENANGO—William Gates, Rockland; J. P. Byers, Cooperstown; James Russel, Polk. WARREN—G. P. Meade, Youngsville; Daniel Lott, Lottsville; F. R. Miller, Sugar Grove. WASHINGTON—H. C. Slusher, Sunset or Lone Pine. WAYNE—E. W. Hamlin, Bethany; T. J. Crocker, Boyd's Mills; L. T. Underwood, Lake Como. WESTMORELAND—John Beaty, Beaty; Hortensus Lowry, West Newton. WYOMING—O. E. Reynolds, West Nicholson; H. H. Mitchel, Lemon. YORK—W. S. Roland, York.

Extracts from some of the Correspondence.

J. S. Elder, of Beaver county, remarks that "timber belts should be left for the protection of fields. Our county has been cleared without any definite plan, unless it was to cut out the timber without regard to plan, economy, or real benefit to the farmer."

A. D. Weir, of Butler county, says: "It is evident something must be done in this State to protect our forests from wanton waste, or our State must suffer in the near future from drouth that seems to be inevitable if the destruction of the forests is not arrested."

W. R. Shelmire, of Chester: "Our county supplies very little timber for commercial purposes, but, on the whole, it is tolerably well wooded with a young growth, principally chestnut, used for fencing purposes."

T. Speakman, of the Chadd's Ford Farmers' Club, of Delaware county, writes: "The following was approved by the club and ordered to be forwarded to your committee:

"*To the Committee on Forests and Forestry, of the Board of Agriculture, State of Pennsylvania:*

"In answering the queries propounded by your circular of September 15, Townsend Speakman, a member of the Chadd's Ford Farmers' Club, to whom one of them was referred, has introduced the following, which, together with the answers to your questions, is indorsed by us, and directed to be forwarded to one of your committee:

"We look upon the question referred to as one of vast importance to the present and still more to future generations, and if your Board can, by the agitation of this subject, save the life of a single tree, you will not have labored in vain. Statistics, aided by our own observations, convince us that the wholesale destruction of our native forests is fraught with incalculable danger to the future prosperity of not only the agricultural, but many other interests as well. We believe that the excessive drouths, severe tornadoes, and cyclones, which have of late years prevailed to such an alarming extent, even in our own favored section, owe their destructiveness, in a measure, to stripping the country of its natural protectors—the native forests—and we join with you in calling upon the owners of lands to 'cry a halt' to this, in many cases, wanton destruction, and to urge upon them, in its stead, a better cultivation of the lands already cleared. 'An ounce of prevention is worth a pound of cure,' and it is much easier than to replace them, and though something may be done by the planting of orchards and other trees as wind-breaks and protectors of our springs, still this can only be a partial remedy. What legislation may be necessary and practicable we leave for your wisdom to find out and obtain, but any such as will be adequate to meet and check the evil will, we fear, be difficult to procure, owing to the inherent rights of individual landowners and their jealousy of any interference in the disposal of the product of the soil, as their best judgment may suggest. All the aid that we can give your Board towards the education of public sentiment on this important subject, or in the procurement of suitable legislation, will be most cheerfully rendered by the club.

"The answers to your queries can be, at best, but mere guess work, but are given in our best knowledge and belief."

John C. McAllister, of Elk county: "I believe that the time has not yet arrived when the cultivation of forest trees would be successful for various reasons. The first is the large amount of old timber yet remaining, renders it unnecessary at present; and men will not engage in a business if not forced to, in which they will not be likely to reap any satisfactory returns. Another, is the large amount of young timber springing up, where the old timber is removed, and the land is not cultivated, and which will take the place of the old in time."

R. M. McDevit, of Huntingdon county: "The destruction of forest timber is rapidly on the increase, and is only supplied by the slow process of nature. Forests of some kinds of timber will recuperate much more rapidly than others, but there is only a small proportion of tillable land that has not already been stripped of timber for agricultural purposes, while the rapidly increasing demand for lumber, and the wants of our extensive iron manufactories create a demand for charcoal, which is making indiscriminate havoc of the mountain timber. In some sections we have large forests of young chestnut, which grow rapidly, on most soils, and is valuable for fencing, and for which there soon will be a largely increased demand, as soon as the new tanning process comes into use. Our forest fires are almost invariably occasioned either by incendiaries or by railroads, and against the latter there seems to be no protection."

Mr. J. B. Conser, of Jefferson county: "If the men and legislators of our day had the best interests of our race in the aggregate at heart, and some real interest in the welfare of the generations which are to come, it would not be long before a law similar to the following, would be and abide upon all our statute books, as permanently as the laws of the Medes and Persians, which changeth not. Let there be a law passed compelling every owner of land of fifty acres and upward, to retain of the original forest, or plant in timber to be kept for that purpose, one acre for every ten owned, and that to be inspected by Government, and to be kept in such condition as to be absolutely proof against forest fires."

Johnson Miller, of Lancaster county: "I believe the idea should be established to induce our farmers to plant more trees. It is, in my opinion, a very important matter, and should engage the attention of every person in the State."

H. C. Falls, of Lawrence county: "I have looked at this question of our forests, in its past, present, and future effects, and it is very evident that the destruction of our forest timber is going to have a telling effect on the country, in many ways, such as the health of our people, the productions of the soil, in large floods ending in long dry spells, and drying up our sparkling springs, and increasing the timber demand for useful purposes, when it is not to be had."

Mr. George W. Kline, of Lebanon county: "As far as I know all timber land of original growth in the farming districts when cleared is at once cultivated and not reproduced; and I believe if the destruction of heavy timber continues in the same ratio as during the last fifteen years, and since the introduction of that modern 'fiend,' the portable saw-mill, that in fifteen years more there will be none left. The acreage of wood land along the South mountain, on Cornwall hills, has not been much reduced within the last twenty years, in fact, greater precautions have been taken to increase and improve the woodland, especially that belonging to the Cornwall estate of the Coleman heirs, by fencing in all the sprouts to keep off cattle that farmers persist in driving to the hills in summer time for free pasture. I venture the opinion that the Cornwall estate has put up fifty miles of fencing through and around their woodland, which, allowing 500 panels per mile, at sixty cents per panel for worm fence, represents an investment of $15,000, merely for the protection of woodland, all of which might have been saved if our legislators had pluck enough to have a proper protective law enacted."

D. Simpson, Jr., McKean county: "Hemlock is being cut very fast at the present time. The bark is selling at $4 50 per cord, and the logs at from $3 00 to $4 00 per 'M.' 'Tis said that at the present rate of cutting it will not last much more than ten years."

Joseph Campbell, of Mifflin county: "We have special legislation to protect the young timber in this county, and it is generally respected. Your committee is doing good work by calling attention to the reckless waste of timber.

William Cromwell, of Pike county: "It is safe to say that nine tenths of the forest fires in Pike and Wayne are principally attributable to the carelessness of railroad employés."

J. W. Allen, of Potter county: "Our forests are very extensive, and nearly all kinds of timber is advancing in value. Several large tanneries lately built and under construction will use up the hemlock in the county in the course of the next fifteen to twenty years. Very few of our citizens seem to take any interest in devising means to protect the forests from destruction.

J. M. Hay, of Somerset: "Timber is very plenty in this county, and people are more anxious to destroy than to grow timber, making farms out of what was a nice forest of timber a few years ago."

Lafayette Gray, Tioga county: "Our noble forests are disappearing like the dew in the morning. We ask where will the next generation get their building material, fencing, &c.? and the answer comes quick and fast, how can I live and keep the timber? or how can I get rich as easy as to cut the forest down?"

William Gates, of Venango county: "We have an abundance of young timber for fencing purposes, but old sound timber is becoming scarce, and in great demand. Forest fires nearly all start from sparks from locomotives on railroads."

F. R. Miller, of Warren county: "As to the kind of legislation needed, there should be exempt from taxation all land that may hereafter be fully planted with valuable timber trees, and the trees reasonably well cared for, for a term not exceeding fifteen or twenty years. In fixing valuations for tax purposes, assessors should discriminate in favor of land growing natural young valuable timber. Also have something of tree culture taught in our common schools, by requiring school-directors to plant and care for a good variety of trees in every school-ground, and teach scholars both the common and scientific name of every tree."

T. J. Crocker, Wayne county: "The forests standing at the present time have little of the value compared with that of a century ago. The lofty pines which then lined the streams and crowned the hills have been removed, and the hemlock, once considered a nuisance, has become valuable."

Hon. N. F. Underwood, Wayne county: "My estimate of the timber supply in this county, is based upon a personal knowledge of twenty-five years' experience in the lumber business. Yet it can only be approximated. Nine or ten tanneries are now getting their bark, hemlock, in part, at least, from this county, and use up yearly say thirty-five thousand cords. Some of them can run but a year or two longer. Those best supplied, will have exhausted their entire stock of bark in from five to eight years."

John Beaty, Westmoreland county: "The legislation we need, is lower the value on wood land. We have so many portable saw-mills in our county at this time, (twenty years ago we had none,) that thousands of feet of lumber are thrown on the market weekly, and in twenty years our timber will be exhausted, and what little will be left will be cleared out for pasture. And without the fallen leaf and underbrush to protect the roots, trees will in a few years decay, leaving the farmers bare of timber, scarce of water, and exposed to violent storms. By lowering the taxes, we encourage three planting."

James Miles, Erie county, a member of the committee, says: "This county has so little waste land, that it is not probable that forest culture will receive the attention it should, for even its climatic influences."

Mr. J. A. Herr, of Clinton county, a member of the committee, expresses the hope that the *press* may be used more extensively to warn the public of the dire results of wantonly destroying our forests, in cutting trees merely for the bark.

Mr. H. L. Scott, Bradford county, also a member of the committee, remarks: "We, in this section of the State, have not given the subject that attention that would naturally be given to it in the older portions. We have not so much felt the necessity of it. This and the adjoining counties are comparatively new, particularly when compared with the eastern portions of the State. Land is still to some extent being cleared for farming purposes, and large amounts of timber are being cut for bark and lumber. Under such circumstances it would not be expected that we would realize the importance of this subject as fully as those residing in the older portions of the State. Neither will the great mass of our people fully realize it till it is too late."

While they do not yet see the necessity of doing something to protect our forests, yet there are portions of our county in which they begin to see the effects of its removal. It is seen in the failure of our streams, those that a few years ago furnished sufficient water for our mills, are now failing, and each year it seems to be growing worse. It is also seen in the rapid rise of the small streams, when there is much rain, doing much damage, and then quickly subsiding. The removal of the forests prevents the water being retained, and it passes off quickly. It is also seen in the failure of springs that used to be never-failing. It fact, there are various ways in which some portions of our county begin to feel the harm that is being done by the removal of our forests, and yet it may be said that we are but just beginning to feel what older portions of the State have been a long time realizing. I know of no remedy that can be applied to make our people realize the great harm that is being done before it is too late. Is is not the ax alone that is doing the damage, but forest fires seem to increase in frequency. I agree with Mr. Sechler, of Montour, in his report, that sportsmen and railroad companies cause much of these fires, and that the railroad company ought to pay damages. I know of no sound reason why a railroad company should not be answerable for the damage caused by their carelessness. I am satisfied they could use means to prevent much of the fires they cause.

Prof. Thomas Meehan, of Philadelphia, also a member of the committee, who had the opportunity to examine the preceding statements in this report, contributes the following:

"The facts brought to light through these inquiries seem to me to be of great value. In my address to the board at Harrisburg a few years ago, I gave it as the result of my own observations, that about one fourth of the area of the State was still under forest. It will be seen by taking the averages of the counties as here given, that the result is exactly one fourth. It may be said that the figures are not exact, some estimates would be too high, and some too low, but the average is no doubt correct; and it may be assumed that for all practicable purposes, we are correct in saying, the forestry area of Pennsylania is about one fourth of its total acreage. This is quite as much as an agricultural State like Pennsylvania ought to have, and if this proportion can be maintained, it would be all that is desirable. But from the replies to the second question we gather that not three per cent. of the woodland cleared is allowed to grow up again as timber. The result must be in time the total destruction of Pennsylvania forest, unless something effectual is done either to preserve the young growth following a clearing, or to plant new forests to about the same extent as those cleared away. I case anything feasible in this direction can be attempted, the facts gathered under questions three, four, and five, will be of inestimable value. We find, for instance, that there are eleven distinct varieties of trees named as flourishing well as timber trees in our State, and for which there is more or less demand: while under the general name of oak, hickory, ash, pine, and elm, almost as many more varieties are included, making, say, at least twenty kinds of timber-producing trees, more or less adapted to our State. Some seem adapted to a wide area, the chestnut, for instance, being reported as doing well in forty-six different counties, in forty-one of which it is in good demand. Some trees are widely adapted to our soil and climate, for which there seems little demand; beech, thriving in fourteen counties, is only much demanded in four, and maple, probably the sugar maple at home, in twenty-seven counties, is appreciated in only six. We seem worse off for pine than for any other kind. White pine and yellow pine (which in Pennsylvania means *Pinus rigida*, or the pitch pine of more northern States) are no doubt chiefly intended. It is reported as doing well now in twenty-four counties, while thirty-four report an active demand for it. By these comparisons and others which may be made, we see how very important the facts given may be in connection with any forestry effort the State may make. With such a great variety doing well, and in good demand, it is no wonder little is suggested under question seven. There are many kinds in other countries or in other States popular, which are found by cultivation to grow very well in the State, for instance, the Catalpa, Alianthus, the Northern Shingle cypress, the Shingle oak, the common cherry, which is much valued by cabinet-makers, and so on. With so much natural value in our forests, it is hardly to be expected that much should be known about the value of any additions from outside sources.

The great point of interest centers around the preservation of old forests, and the encouragement of new plantations. Trees, like any other organic beings, must die in time. Owners of forests who cut for lumber, only anticipate by a few years the work of nature. No legislation can prevent this ultimate result. New forests must come from young trees springing naturally from where old ones stood, or by wholly new plantings. The figures obtained by this report show that where the forests are cut the land is cleared, and very little is left for reforestation. It is not likely that any legislation can prevent this. It is difficult to prevent an owner from doing what he likes with his own, and unless the owner of such land was to receive compensation out of the taxes for being compelled to keep in forest that which he could turn to better advantage, it is not likely any legislation could be had to compel him to do so.

We seem to be thrown wholly on the question, How to encourage new forest plantations?

Considering how recently it is that we have had nearly all the timber we required for barely the cost of cutting, how that not long ago, timber was incumberance, which lessened rather than added to the value of farms, it is surprising to find so many answers inclined to favor profitable planting. It is evident that the popular mind is running in this direction, and it is fortunate, as it is already apparent from our figures, the direction in which we shall ultimately have to go. It seems to me that what we want now, is some practicable demonstration of the value of artificial plantations. It would be of immense service to a proper understanding of this subject, if every county agricultural society would undertake the planting and oversight of, say ten to twenty acres, choosing the trees best adapted to the soils, as indicated by this report, and keeping accurate accounts of the value of the land at the time of planting, and all costs of planting and care, giving the annual report of this Board, of the progress and cost of the work. The State might make a small appropriation to have this work carried out under the care of the county societies. Thus in a very few years, we should have the exact figures in regard to forestry culture. We should know for certain, from the averages in each county, whether there is profit or loss in it, and just how much profit or how much loss, if the returns are profitable, there will need no further inducements for private individuals or companies to embark in the business. If there is loss it will then be a question as to what legislation would be desirable to protect this great public interest, so that those who engage in it may have a fair return for their enterprise. It seems to me it is a proper time now for the Board to take active measures to introduce some such a comprehensive forestry system, with the great object of getting at the exact facts for the public good.

The subject of forest fires need not be considered in connection with such a scheme as this. There can be no forest fires where undergrowth is not permitted. It is the accumulation of dead branches out of dry material among the mass of living undergrowth which makes a forest fire so destructive. In the new system forestry which will follow when all the old forests are gone, none of this ought in any case to be permitted. The young trees should be cultivated for a few years like a corn field, till they grow up to shade the ground, when nothing else of consequence would grow beneath them. How much may be done to prevent fires in existing forests is a question wholly distinct from that which is to be the great question, viz: The planting of new forests. The opinions offered by our correspondents, show by their opposite characters how unsatisfactory any proposition would be. Railroads, hunters, camp-fires, or mere malice may set woods on fire. It may be desirable to insist on the careless parties sharing the damages, or receiving punishment; but no matter what is done in this way, there will never be absolute security against forest fires so long as the accumulation of dead material gathered together through ages remain under natural forests, or the trimmings of the lumbermen remain to give strength to a fire once started by accident or design. Something might be devised out of the counsel of correspondents to make them less frequent, but it is not until the new era of artificial forest culture shall have set in, in which, from the start, underbrush shall have no place, that we may hope for entire freedom from these great calamities.

Should such a scheme of county experiments, as the facts brought out by this report of the committee seem to render desirable, be eventually carried out, it would very much aid the success of the work, if intelligent rules for forest culture adapted to the varieties popular in our State, were prepared by the Board.

I embrace this opportunity to return my sincere thanks to the many kind correspondents throughout the State, for their promptness in returning answers to the circulars issued by the committee, and for the great interest that have generally manifested in this forthcoming report, whilst at the same time I was disappointed, and very much regret, that no returns were received from the counties of Cameron, Carbon, Clarion, Clearfield, Fulton, Lehigh, Monroe, and Schuylkill. In the eight delinquent counties above named, the same number of circulars were sent out as were sent to other counties.

And now in conclusion. Any one who may be interested in this important subject, and will take the time and trouble to examine this report, notice the tabular statements and carefully expressed opinions of the many correspondents to the questions submitted to them, as also the views of some of the members of the committee, will observe that whilst there may be some slight difference of opinion found in the answers to the several questions, as well as in some of the views of correspondents and members of the committee, yet it is obvious that on the great and all important subject *of the care of our forests*, there is a most decided unanimity of sentiment that the demand and consumption of timber from all parts of the State is rapidly diminishing our forests, and judging from the past and present demands, it is not a very difficult problem to calculate just how long it will take to use up our remaining supply of native timber. When we take into consideration this constant and increasing call for timber required for our manufactures, for building purposes, for railroad ties, for telegraph poles, for fences, &c., it is easily demonstrated that unless replanting is strongly urged and actually carried into effect, the supply of some of the varieties most in demand must soon run out.

I am a believer in the doctrine that if this wholesale waste of our forests is permitted to go on as it seems to be progressing, without preparing and providing for the introduction of a new growth, that it will eventually not only severely affect the business relations of the State, but will also seriously impair the health and comfort of our people. "Trees are the dominating members of the vegetable kingdom. They are necessary factors in the sum total of those influences which constitute the environment of animal life. Trees, by absorbing carbonic gas and emitting oxygen, act as agents in rendering the atmosphere life-sustaining. By interposing their foliage between the sun and the earth, they serve a useful purpose in sheltering the soil from heat, and, as conductors of heat, in equalizing the temperature of the earth and the air. The forest, too, guards the soil against abrasion and displacement from torrents and overflows, and thus again exerts its conservative influence for man's good. We need trees for the delight they afford, as at once the most majestic, imposing, and beautiful of nature's vegetable forms. The State cannot afford, and should not much longer withhold, or refuse to give the subject of our forests its most serious attention."

Governor Hartranft, in one of his messages to the Legislature, said: "I especially invite your attention to an evil of considerable magnitude, which every year grows more aggravated, and in certain regions at times is the occasion of serious apprehension and loss; I refer to the wholesale destruction of our forests."

This subject has awakened the people in some of our sister States, where their own necessities have caused them to offer liberal premiums for the encouragement of tree planting. In Minnesota they have organized forestry associations, which in 1877, was instrumental in having from eight to ten million of trees planted. A day, the first Tuesday in May, is especially set apart, and is called "Arbor day," or tree-planting day. Efforts have also been made in other States for the observance of similar occasions; Governor Foster, of Ohio, appointed April 27, as "Arbor day" in that State, and Governor Nance, of Nebraska, appointed April 19, and urged everybody in the State to plant a tree on that day; and this, we are told, is only the beginning of the great and very necessary enterprise. When we thus see this important movement going on in other States, shall the people of Pennsylvania fold their arms, close their eyes, and do nothing? It is sincerely hoped that they will jealously guard their own interests. Let them but remember, that from year to year, as our population and our industries increase, the demand for timber will proportionally increase, and to meet these wants our forests must surely give out, unless the supply is kept up, and this can only be done by resorting to tree planting. And now, if our people have so sadly heretofore neglected these admonitions, by continuing inactive, we think it is high time and we urge it upon them, to wake up, and no longer refrain from giving the subject their most earnest attention. And how best can this be accomplished? We think the best plan is through intelligent legislation, by local agricultural societies, and the support of the State Board of Agriculture.

Pennsylvania Woods.—Specific Gravity.—Weight per Foot and Fuel Value. Tenth Census.

COMMON NAME.	BOTANICAL NAME.	Specific gravity.	Per cent. of ash.	Weight per cubic foot.	Fuel value.
White oak,	*Quercus alba,*	.7438	.41	46.36	741
Red oak,	*Quercus rubra,*	.6612	.26	41.21	660
Pine oak,	*Quercus palustris,*	.6938	.81	43.23	688
Chestnut oak,	*Queecus muhlenberii,*	.8395	1.21	52.32	829
Chestnut,	*Castanea vesca,*	.4504	.20	28.07	450
Walnut,	*Juglans nigra,*	.6143	.70	38.28	610
Butternut,	*Juglans Liquid amber,*	.4086	.51	25.46	407
Pignut hickory,	*Carya porcina,*	.8417	.87	52.45	834
Shellbark,	*Carya alba,*	.8372	.73	52.17	831
Sugar maple,	*Acer saccharinum,*	.6827	.58	42.52	679
Silver maple,	*Acer dasycarpum,*	.5269	.33	32.83	525
Red maple,	*Acer rubrum,*	.6245	.37	38.92	322
Slippery elm,	*Ulmus fulva,*	.7035	.83	43.85	698
White elm,	*Ulmus Americana,*	.6516	.80	40.61	647
Rock elm,	*Ulmus racemosa,*	.7263	.50	45.26	723
White pine,	*Pinus Strobus,*	.3842	.19	23.94	384
Sugar pine,	*Pinus Lambertiana,*	.3684	.22	22.96	368
Pitch pine,	*Pinus rigida,*	.4957	.24	30.89	495
Yellow pine,	*Pinus mitis,*	.6104	.29	38.26	607
Black spruce,	*Picea nigra,*	.4584	.28	28.57	457
White spruce,	*Picea alba,*	.4051	.32	25.24	404
Basswood,	*Tilio Americana,*	.4525	.55	28.30	450
Locust,	*Robinia Pseudacacia,*	.7333	.50	45.70	730
Dogwood,	*Cornus Florida,*	.8153	.67	50.81	810
Persimmon,	*Diosyros Virginiana,*	.7908	.96	49.38	783
White ash,	*Fraxinus Americana,*	.6530	.42	40.70	650
Black ash,	*Fraxinus sambucifolia,*	.6317	.72	39.36	627
Sassafras,	*Sassafras officinale,*	.5062	.08	31.50	506
Mulberry,	*Morus rubra,*	.7715	.58	48.08	767
Beech,	*Fagus ferruginea,*	.6883	.51	42.89	685
Red cedar,	*Juniperus Virginiana,*	.4296	.13	30.70	491
Catalpa,	*Catalpa bignonioides,*	.4474	.38	27.88	446
Sycamore,	*Platanus occidentalis,*	.6005	.46	37.42	598
White birch,	*Betula alba,*	.5760	.29	35.90	574
Prickley ash,	*Xanthroxylum Americanum,*	.5652	.57	35.92	562
Wild plum,	*Prunus Americana,*	.7215	.18	44.96	720
Wild cherry,	*Prunus Serotina,*	.5832	.15	36.28	581
Sweet gum,	*Liquidambecinerea styraciflua,*	.5946	.61	37.05	591
Sour gum,	*Nyssa sylvatica,*	.6399	.52	39.88	637
Mountain ash,	*Pyrua Americana,*	.5828	.35	36.22	581
Osage orange,	*Maclura aurantiaca,*	.7668	.88	47.79	760
Hornbeam,	*Carpinus Caroliniana,*	.7258	.83	45.23	720
Hemlock spruce,	*Abies Canandensis,*	.4202	.46	26.18	418

List of Trees for Practical and Ornamental Planting.

By JOSIAH HOOPES, *Pomologist of the Board.*

SCIENTIFIC NAME.	COMMON NAME.	RECOMMENDED FOR	SEEDS MATURE.	DESCRIPTION OF SEEDS.
Acer campestre, *L.*,	English or corked-bark Maple,	Manufacturing, Fuel, Ornament,	September,	Key-fruit; wing widely divergent.
Do. dasycarpum, *Ehr.*,	White, Silver, or Soft Maple,	Ornament, Sugar,	May,	do. do. large.
Do. platanoides, *L.*,	Norway Maple,	do. do.	Sept. and Oct.,	do. divaricate.
Do. pseudo-platanus, *L.*,	Sycamore Maple,	do. Manf., Fuel,	do. do.	do. somewhat diverging.
Do. rubrum, *L.*,	Red or Swamp Maple,	do. do. do.	September,	do. small, diverging.
Do. saccharinum, *Wang.*,	Sugar, Rock, or Hard Maple,	do. do. do. Sugar,	do.	do. slightly diverging.
Do. do. var. nigrum,	Black Sugar Maple,	do. do. do. do.	do.	do. do.
Abies alba, *Michx.*,	White or Single Spruce,	do.	October,	Seeds small, very small wings; cones small
Do. balsamea, *Marshall*,	Balsam, or Balm of Gilead Fir,	do. (?) Balsam,	do.	Seeds small, in rather large cones.
Do. Canadensis, *Michx.*,	Common Hemlock Spruce,	do. Hedging, Timber,	do.	Seeds very small, small wings, very small cones.
Do. excelsa, *D. C.*,	Norway Spruce,	do. do. do.	do.	Seeds small, small wings, long cones.
Do. Nordmanniana, *Link.*,	Nordmann's Silver Fir,	do.	September,	Seeds medium, small wings, long cones.
Do. orientalis, *Poir.*,	Oriental Spruce,	do.	October,	Seeds very small, small wings, cones medium.
Æsculus flava, *Ait.*,	Sweet Buckeye,	do.	do.	Large nuts in fleshy covering.
Do. glabra, *Willd.*,	Fetid, or Ohio Buckeye,	do.	do.	do. do.
Do. Hippocastanum, *L.*,	European Horse Chestnut,	do.	do.	do. do.
Ailanthus glandulosus, *Desf.*,	Tree of Heaven, or Paradise,	do. (?) Timber,	September,	Key-fruit, small.
Betula alba, *L.*,	White Birch,	do. Fuel, Manufacturing	August,	Minute winged nutlets.
Do. do. var. populifolia, *Spach*	American White Birch,	do. Timber,	do.	do. do.
Do. lenta, *L.*,	Cherry, Sweet, or Black Birch,	do. Manufacturing,	do.	do. do.
Do. lutea, *Michx.*,	Yellow or Gray Birch,	do. do.	do.	do. do.
Do. nigra, *L.*,	River or Red Birch,	do. do.	do.	do. do.
Do. papyracea, *Ait.*,	Paper or Canoe Birch,	do. do. Fuel,	do.	do. do.
Carya alba, *Nutt.*,	Shell-bark or Shag-bark Hickory,	Nuts, Timber, Fuel,	October,	Nuts with leathery covering.
Do. amara, *Nutt.*,	Bitter-nut or Swamp Hickory,	Manufacturing, Fuel,	do.	do. do.
Do. microcarpa, *Nutt.*,	Small-fruited Hickory,	do. do.	do.	do. do.
Do. olivæformis, *Nutt.*,	Pecan-nut,	do. do. Nuts,	do.	do. do.
Do. porcina, *Nutt.*,	Pig-nut or Broom Hickory,	do. do.	do.	do. do.
Do. tomentosa, *Nutt.*,	Mocker-nut. White-heart Hickory,	do. do.	do.	do. do.
Castanea vesca, *L.*,	Chestnut,	Timber, Nuts,	do.	Nuts in prickly covering.
Do. pumila, *Michx.*,	Chinquapin,	Nuts,	do.	do. do.
Catalpa bignonioides, *Walt.*,	Catalpa, Indian Bean,	Timber, Ornament,	do.	Seeds small, in long capsules.
Celtis occidentalis, *L.*,	Sugarberry, Hackberry, Nettle-tree,	do. do.	September,	Drupes, covering thin.
Cornus florida, *L.*,	Flowering Dog-wood,	do. do.	do.	Drupes, berry-like.
Cupressus thyoides, *L.*,	White Cedar,	do. do.	October,	Seeds very small, in very small cones.
Diospyros Virginiana, *L.*,	Date Plum. Persimmon,	Manufacturing, Fruit,	November,	Large flat seeds, in a plum-like fruit.
Fagus ferruginea, *Ait.*,	American Beech,	do. Fuel, Ornament	September,	Angular nuts in a calyx or cup.
Fagus sylvatica, *L.*,	European Beech,	do. do. do.	do.	do. do.
Fraxinus Americana, *L.*,	American White Ash,	do. Ornament,	Sept. and Oct.,	Seeds winged at the apex. Key-fruit.
Do. excelsior, *L.*,	European Ash,	do. do.	October,	Seeds encircled by the wing. Key-fruit.

LIST OF TREES—*Continued.*

SCIENTIFIC NAME.	COMMON NAME.	RECOMMENDED FOR	SEEDS MATURE.	DESCRIPTION OF SEEDS.
Fraxinus quadrangulata, *Michx.*,	Blue Ash,	Manufacturing, Ornament,	Sept. and Oct.,	Seeds encircled by the wing. Key-fruit.
Do. sambucifolia, *Lam.*,	Black or Water Ash,	do. do.	do. do.	do. do. do.
Gleditschia triacanthos, *L.*,	Honey or Three-thorned Locust,	Hedging, Ornament,	September,	Seeds nut-like in long pods.
Gymnocladus Candensis, *Lam.*,	Kentucky Coffee,	Manufacturing, Ornament,	October,	do. do.
Halesia tetraptera, *L.*,	Snow-drop or Silver-bell tree,	Ornament,	do.	Seeds in large four-winged dry fruit.
Ilex opaca, *Ait.*,	American Holly,	do.	September,	Nutlets in red drupes.
Juglans cinerea, *L.*,	Butternut. White Walnut,	do. Timber, Nuts,	do.	Large hard-shell nuts; drupe-like.
Do. nigra, *L.*,	Black Walnut,	do. do. do.	October,	do. do. do.
Do. regia, *L.*,	English Walnut,	do. do. do.	do.	do. do. do.
Juniperus Virginiana, *L.*,	Red Cedar,	do. do.	do.	Seeds bony, in a berry-like fruit.
Kolreuteria paniculata, *Laxm.*,	Kolreuteria,	do.	September,	Seeds in inflated capsules.
Larix Americana, *Michx.*,	American Larch. Tamarack. Hackmatack	do. Timber,	October,	Winged seeds in small cones.
Do. Europœa, *D. C.*,	European Larch,	do. do. Shelter,	do.	do. do.
Liquidambar Styraciflua, *L.*,	Sweet Gum. Bilstead,	do. do.	do.	Seeds with a wing-angled coat.
Liriodendron tulipifera, *L.*,	Tulip-tree. Tulip Poplar, wrongly,	do. do.	do.	Key-fruit like in a cone.
Magnolia acuminata, *L.*,	Cucumber-tree,	do. do. Street pl'ng,	do.	Berry-like seeds, in cone-like fruit.
Do. conspicua,	Chinese White Magnolia,	do.	do.	do. do.
Do. glanca. *L.*,	Swamp Magnolia. Sweet Bay,	do.	September,	do. do.
Do. macrophylla, *Michx.*,	Great-leaved Magnolia,	do.	October,	do. do.
Maclura aurantiaca, *Nutt.*,	Osage Orange,	Hedging, Timber,	November,	Small nutlets in an orange-like fruit.
Morus alba, *L.*,	White-fruited Mulberry,	Fruit, do.	July,	Seeds small, in blackberry-like fruit.
Do. rubra, *L.*,	Red-fruited Mulberry,	do. do.	do.	do. do.
Negundo aceroides, *Moench.*,	Ash-leaved Maple. Box-Elder,	Shade, Shelter, Timber,	September,	Key-fruit, small.
Nyssa multiflora, *Wang.*,	Black or Sour Gum. Tupelo,	Ornament, Fuel, Manufacturing	do.	Bony seed in a fleshy drupe.
Pinus Austriaca, *Hoess.*,	Austrian Pine,	do. Wind-break,	October,	Winged seed in cones.
Do. mitis, *Michx.*,	Short-leaved Yellow Pine,	do. Timber,	do.	do. do.
Do. pungens, *Michx.*,	Table Mountain Pine,	do.	do.	do. do.
Do. resinoso. *Ait.*,	Red or Resinous Pine,	do. Fuel, Timber, Resin,	do.	do. do.
Do. rigida, *Mill.*,	Pitch Pine,	do. do. do.	do.	do. do.
Do. strobus, *L.*,	White or Weymouth Pine,	do. Timber,	do.	do. do.
Do. sylvestris, *L.*,	Scotch Pine or Fir,	do. do. Shelter,	do.	do. do.
Platanus occidentalis, *L.*,	American Plane. Buttonwood. Sycamore	Shade, Timber,	do.	Small nuts in round heads or balls.
Do. orientalis, *L.*,	The Oriental Plane or Sycamore,	do. do.	do.	do. do. do.
Populus alba, *L.*,	White Abele or Poplar,	Timber, Street planting,	May,	Seeds minute. (Propag'd from cuttings.)
Do. angulata, *Ait.*,	Angled Cotton-wood,	Street planting,	do.	do. do. do.
Do. balsamifera, *L.*,	Balsam Poplar,	do.	do.	do. do. do.
Do. var. candicans,	Balm of Gilead,	do.	do.	do. do. do.
Do. grandidentata, *Michx.*,	Large-toothed Aspen,	do.	do.	do. do. do.
Do. heterophylla, *L.*,	Downy Poplar,	do.	do.	do. do. do.
Do. monilifera, *Ait.*,	Cottonwood,	Wind-break. Street planting,	do.	do. do. do.
Do. tremuloides. *Michx.*,	American Aspen,	Ornament, Street planting,	do.	do. do. do.
(NOTE.—All the poplars are liable	to sucker freely, but are rapid growing,	hardy trees.		
Prunus Avium, *L.*,	Common Black Cherry,	Stocks, Timber, Fruit,	June,	Bony stone in a fleshy drupe.
Do. Mahaleb, *L.*,	Mahaleb or Perfumed Cherry,	do. do. Ornament,	August,	do. do.
Do. Padus, *L.*,	European Bird Cherry,	do. do. do.	do.	do. do.
Do. Pennsylvanica, *L.*,	Wild Red Cherry,	do. do. do.	do.	do. do.

LIST OF TREES—*Continued.*

SCIENTIFIC NAME.	COMMON NAME.	RECOMMENDED FOR	SEEDS MATURE.	DESCRIPTION OF SEEDS.
Prunus serotina, *Ehrhart*,	Wild Black Cherry,	Stocks, Timber, Ornament,	August,	Bony stone in a fleshy drupe.
Pyrus aucuparia, *Gærtn*,	European Mountain-Ash. Rowan-tree,	do. do. do.		Seeds in berry-like fruit.
Do. coronaria, *L.*,	American Crab-apple,	do. do. do.		Fruit similar to cultivated apple.
Do. communis, *L.*,	Common Pear-tree,	Fruit, do. do.	Autumn,	Seeds in edible, fleshy fruits.
(The species of Mt. Ash are	subject to the depredations of a destruc	tive wood-borer.)		
Quercus alba, *L.*,	White Oak,	Timber, Ornament,	October,	Nut or acorn, in a cup.
Do. bicolor, *Willd.*,	Swamp White Oak,	do. do.	do.	do. do.
Do. coccinea, *Wang.*,	Scarlet Oak,	do. do.	do.	do. do.
Do. var. tinctoria, *Gray*,	Black Oak,	do. do.	do.	do. do.
Do. var. ambigua, *Gray*,	Gray Oak,	do. do.	do.	do. do.
Do. falcata, *Michx.*,	Spanish Oak,	do. do. Tanning,	do.	do. do.
Do. imbrecaria, *Michx.*,	Laurel or Shingle Oak,	do. do.	do.	do. do.
Do. lyrata, *Walt.*,	Over-cup,	do. do.	do.	do. do.
Do. nigra, *L.*,	Black Jack,	Fuel, do.	do.	do. do.
Do. obtusiloba, *Michx.*,	Post or Barren Oak,	Timber, do.	do.	do. do.
Do. palustris, *Du Roi*,	Pin or Swamp Spanish Oak,	do. do.	do.	do. do.
Do. phellos, *L.*,	Willow or Pigeon Oak,	do. do.	do.	do. do.
Do. Prinus, *L.*,	Chestnut Oak,	do. do.	do.	do. do.
Do. var. monticola, *Michx.*,	Rock Chestnut Oak,	do. do.	do.	do. do.
Do. var. acuminata, *Michx.*,	Yellow or True Chestnut Oak,	do. do.	do.	do. do.
Do. rubra, *L.*,	Red Oak,	do. do.	do.	do. do.
Robinia Pseudacacia, *L.*,	Common Locust,	do. do.	September,	Nut-like seeds in flattened pods.
Do. viscosa, *Vent*,	Clammy Locust,	Ornament,	do.	do do.
Salix alba, *L.*,	White Willow,	Timber, Ornament, Shelter,	May,	Minute seeds with tufts of hair.
Do. Babylonica, *Taurn*,	Babylonian Weeping Willow,	do. do.	do.	do. do.
Do. fragilis, *L.*,	Brittle Willow,	Basket-work, Ornament,	do.	do. do.
Do. lucida, *Muhl.*,	Shining Willow,	Ornament,	do.	do. do.
Do. purpurea, *L.*,	Purple Willow,	Basket-work, Ornament,	do.	do. do.
Do. viminalis, *L.*,	Basket Osier,	do. do.	do.	do. do.
Sassafras officinale, *Nus.*,	Sassafras,	Officinal properties, Ornament,	September,	Fruit a 1-seeded berry or drupe.
Taxodium distichum, Richard,	Bald or Deciduous Cypress,	Ornament, Timber,	October,	Small seeds, with narrow wings, in globular cones.
Thuja occidentalis, *L.*,	American Arbor Vitæ,	do. Hedging, Shelter,	September,	Small winged seeds in small cones.
Tilia Americana, *L.*,	Basswood. American Linden,	do. Timber,	do.	Seed, a small pendulous nut.
Do. Europœa, *L.*,	European Linden. Lime-tree,	do. do.	do.	do. do.
Ulmus alata, *Michx.*,	Whahoo or Winged Elm,	do. do.	June,	Small seeds winged all round.
Do. Americana, *L.*,	American or White Elm,	do. Medicinal, Timber,	do.	do. do.
Do. fulva, *Mich.*,	Slippery or Red Elm,	do. Timber,	do.	do. do.
Do. campestris, *L.*,	Common English Elm,	do. do.	do.	do. do.
(The foliage of the Elm is fre	quently destroyed by an injurious insect.			

REPORT OF COMMITTEE ON THE EFFECT OF DISCRIMINATION IN FREIGHTS UPON THE AGRICULTURE OF THE STATE.

Ry A. N. PERRIN, *Chairman.*

Read at the Spring Meeting.

The committee appointed to report upon the effect upon Pennsylvania agriculture caused by the system or practice of discrimination in rates of freight between shippers by common carriers, have not been able to procure that accurate statistical information for which they sought, and are, therefore, obliged in the main to give general statements of results, and to present the subject intrusted to them in its broader aspects.

While our immediate attention is being directed to that branch of the question concerning our home or State interests, it may not be unfitting to note at the same time that the subject is as broad as our country, and demands the careful attention and thoughtful study of all who would contribute to the prosperity and happiness of the industrious and frugal millions.

It will be remembered that views upon the transportation question were presented by the Board of Trade and Transportation of New York, to Messrs. Allen G. Thurman, Elihu B. Washburn, and T. M. Cooley, commissioners for determining what should be the relative rates between the West and the various seaboard cities.

In that report there are two principles declared, so sound and plain as to be axiomatic, while they need only to be accepted and applied in order to solve the question under consideration, as well as all others of like nature, inter-state or national.

1. The New York Board of Trade and Transportation, an organization representing more than eight hundred business firms, declares as follows:

That the rates of transportation between the west and the seaboard by the various lines, can only be equitably determined upon the principle of the *cost of the service.*

2. That the principle of "Cost of Service" enters into the question of the relations of these modern highways *to the people.*

Had your committee any doubts of the utter disregard of the foregoing principles by the transportation companies doing business in and through the State of Pennsylvania, they have been dispelled by the information gathered from the members constituting this board, and from such various sections as to fairly represent the conditions throughout the entire State.

It is not our purpose, however, to leave the impression that the transportation companies of Pennsylvania pursue a policy materially different from those of other States, and yet it is with *them* that we have to do, as we discuss the effect on the agricultural products of Pennsylvania. Of the sixty-seven counties of Pennsylvania, the inhabitants of not less than fifty are largely devoted to agricultural pursuits, and agriculture in them forms the main source of the prosperity and growth of the country.

This board is composed of representatives from forty-four county agricultural societies. Information upon the subject of inquiry has been received from twenty-six, and in these it appears to the knowledge of members of your society, discrimination in freight rates exists in eleven, while it is reported not to be within the knowledge of those to whom inquiries were made in fifteen.

Assuming for the purpose of this report that unequal rates of transportation do not exist in the sections represented by the fifteen societies referred to, and taking the reports as made, coming as they do, from all parts of the State, as fairly representing the actual state of affairs, we may justly conclude that common carriers doing business in about one half of the counties of the Commonwealth, discriminate against the Pennsylvania farmers in the matter of rates of freight. With the discriminations well known to be practiced in the carrying of iron, coal, and petroleum, your committee have nothing to do except to remark that the farmer suffers as a citizen and consumer, along with all other citizens, in whatever evil may arise from the injury to the business interests connected with these products. In receiving the answers to the questions sent out by your committee, which established the fact of discrimination in freight rates against individuals, there was also disclosed the fact of discrimination against localities or communities, as compared with other localities or communities. To illustrate: This was revealed by the answer to the following question: Give the price paid at the point of shipment on the 15th of February, 1882, for wheat. The answers varied (quality being observed) from $1 20 to $1 40 per bushel. The price seems to have been governed not by the distance from the producer to the consumer, so much as from the fact that in the one case there was competition in carrying, while in the other there was none, which fact was ascertained by your committee, by requiring an answer to that quesrion in all cases. The questions asked by your committee covered nearly all the products of the farm, and the variation in prices as indicated by the illustrations given, prevailed throughout.

Again, in answer to the question of rates of freight from various points to the seaboard cities, ofttimes it was less from points two to four hundred miles, than it was for the shorter distances, and this, also, was usually governed by competition, or the lack of the same. The fact as to the discrimination in favor of some shippers as against others being established, also in favor of some communities, as against others, before considering their effects, it may be well to examine briefly into the reasons given for it by the carriers, and the manner in which it is practiced. The reasons given by the railroad companies, are mainly: 1. That it costs them more in proportion to receive, transport, and deliver a small quantity of freight, than a large amount; and, 2. That owing to competition of other carrying companies by land and by water, it is necessary for them to charge, not according to the distance carried, but to and through all points at which competition exists, (called competing points,) according to the charges made by other carriers, or as expressed by them, a rate of freight "which the traffic will bear," or in other words, each commodity transported is charged for, at a rate which will secure to the local carrier its proportion of the business as against the competition of a rival line.

Let us carefully consider these reasons, as the admission of the right to exercise these powers carries with it the authority for a "self-constituted body to assume one of the highest prerogatives of a State, that of regulating commerce." The subject is a great one, requiring our best thought and most determined action in the direction not only of self interest, but as citizens watchful of the growth of political evil and obligated for its removal. 1. The general principle that a carrier should be compensated for the evident additional cost of handling a small lot of local freight over that of a large quantity for transportation over a long distance, is correct. The difficulty arises from its attempted application, and the vesting in the carrier the exclusive and arbitrary power of determining without control what is and what is not a "small shipper," and in not limiting by some rule based upon experience that which shall be denominated a "small shipment." No one could sustain the position that a carrier by rail should be compelled to carry one hundred pounds of freight twenty-five miles for a transcient shipper, for the same rate per mile that would be charged for a car load shipped five hundred miles. Hence the necessity of establishing a unit, and the best opinions of experienced men are, that on all local freights, the car load should be the unit, and that against the shipper of the car load there should be no discrimination. As to longer distances, opinions differ, some insisting that the car load should be the unit for all distances, which opinion your committee shares, and yet others that a certain number of car loads should be so established. Bearing in mind that under our system of government, which has constantly in view as its object the greatest good to the greatest number, and the constant protection of the weaker and minority interests against the oppression of the stronger and majority, it seems too plain for argument, that no arbitrary power should be given for a common carrier to say to one farmer, mill owner, or other shipper, you are small, and your rate of freight is so much; to another, you are a large and regular shipper, and we will carry for you for less than your neighbor.

Such a system, pursued with all its boundless opportunities for corruption and favoritism, would build up the business of one man, and utterly ruin that of another, while monopolies would spring up and flourish under the sanction of law. The first reason given by the carriers for local discriminations in freight rates against any Pennsylvania farmer is specious and unsound. *Second.* The remaining main reason for discrimination in freight rates, if well founded, excuses not only arbitrary differences as between individuals, but the building up of favored localities to the detriment of others, by the establishment of "competing points," so called, without any reason for their existing in nature, and at the mere will of the railroad carrying companies. Resting under this condition of affairs, the prosperity of a large grain or stock region of Pennsylvania may be placed at a great disadvantage, if not seriously crippled, because not so situated as to be within reach of one of these arbitrarily-established competing points, established with a view merely of contending for traffic it may be, one thousand miles west or south or north. The farmers of two or three adjoining counties in Pennsylvania may be compelled under this system to pay a rate of freight, even if there are what are denominated "large shippers," greatly in excess of that paid by others engaged in the producing of the same commodity hundreds of miles distant from them, and hundreds of miles further away from the common markets.

This is the course complained of under the general charge of "higher rates for short distances than are charged for long." In many such cases the Pennsylvania farmer is injured by the indirect action of these evil forces. If there is a mill near him to which he takes his grain, and the owner, under the operation of the "competing system," so called, is made to pay a rate of freight one fifth greater for shipment to Philadelphia, New York, or Baltimore, a distance of, say two hundred miles, than that charged to the Ohio, Indiana, or Illinois miller for twice or three times the distance, it is evident that he cannot prosper under this tax of one fifth of the freight rate without compensation from some source. Consequently he pays less for grain, and, if necessary, combines with his neighboring millers to enable him to obtain it at less price. Combination begets combination, and gradually the whole commercial fabric, founded at all times and in all cases upon the producer of the raw material, becomes artificial, corrupt, and oppressive, and the seed is sown for financial panics and business depression. Free trade, under the laws of trade, is a commercial principle of never-failing excellence and stability. A life of artificial stimulation, by railway combination, will undermine the prosperity of the agricultural, as well as commercial, interests of the country. They are indissolubly joined.

We are brought now to consider what may be well denominated the great sham of the second main reason given for freight discriminations against localities. It is said that this is a competitive system; that it results from the warring of great railway carriers to acquire traffic, and the outcome of it is reduced rates of freight, which are beneficial to all shippers. Elaborate tables are prepared, showing that the rates charged are much less than they were ten or twenty years ago. It is true that low rates of freight are, to a certain extent, beneficial—but temporary and dangerous, because inconstant—to the commerce of the country, but they are *mainly* so to the consumer, and not to any great extent to the producer. The dealer, speculator, and purchaser may, for the time, be interested in *low* freights. The producer, at all times, in *equal* freights. It is the question of *equality of rates*, as bearing upon the interests of the Pennsylvania farmer, that is under discussion.

While the rebate or special preferential system stands he will suffer in his business. Low rates are beneficial exactly in proportion as they lessen the ability of the carrier to discriminate without actual loss.

Furthermore, competition exists between the railroad carrying companies only when some one or more is getting exorbitant rates of freight. Whenever competition begins to lower the charges below the sum, the managers, either from necessity or grasping avarice, think they should have, competition stops and the result is a "pool," in which all traffic is divided among the carriers, a rate fixed on each class of goods to be charged by all, and this rate is "what the traffic will bear." Cost of carriage has nothing to do with fixing the charge. At what precise point competition will cease and combination begin, the farmer, the miner, the lumberman, the manufacturer, is powerless to know and impotent to control. At what price his goods can be carried, at what rate per mile, or one hundred miles, in what quantities, between what localities, for how long he can depend upon the arrangement, whether for a week or a month, he knows not. All is subject to the arbitrary dictations of a half dozen railroad magnates, whose decrees are subject to review by no higher power and whose acts are controlled by no law. In considering the effect upon agricultural pursuits in Pennsylvania of the practice by common carriers of discrimination in freight rates, it is well to remember that it is not confined to losses on grain, nor yet to the indirect increase of the cost of the necessities of life. The railroad corporation combinations extend now to every staple product of the country. There are live stock "pools," as well as those to control the traffic in grain, coal, &c.

To arrive at the precise loss to the Pennsylvania farmer by these uncontrollable freight tariffs, it must be ascertained how much of each kind of grain is transported to the seaboard ports, or exported from the State, and also of live stock and other products. Pennsylvania is nearer to the markets of export than any of the middle or older western States, and, from her geographical position, ought to have the advantage of adjacent and convenient markets. This cannot be if Chicago, St. Louis, and other western points, with their tributary territory, are permitted to dictate, through railway managers, the rates of freight for the Pennsylvania farmer, and to place the agriculturist of Iowa, Illinois, and other western States, artificially nearer to the markets than his co-laborer for Pennsylvania. If grain and live stock, raised in the far west, from one thousand to fifteen hundred miles from New York, Philadelphia, and Baltimore, can be delivered in those cities at the same, or a less price per car load than that raised on the soil of Pennsylvania, then the loss to our farmers is beyond question, annual and continuing, and falls upon the whole body of our citizens engaged in the cultivation of the earth. If within the boundaries of the Commonwealth, certain localities can be discriminated against, while others are favored, by affording special and secret rates to chosen individuals which others cannot obtain, then a fictitious and artificial prosperity may be found in some places, while the sun of railroad preference happens to shine upon them, while again, decay and loss of population will mark those that are discriminated against, provided the same be excessive and continuous. It was said of old that "the authority of the Prince must be defended by a military force; that force can only be maintained by taxes; all taxes must at last fall upon agriculture, and agriculture can never flourish except under the protection of justice and moderation."

Your committee say that the rights of the people must be defended by the authority of the State; the State can only be maintained by taxes; all taxes must at last fall upon agriculture, and agriculture can never flourish except under the protection of justice and moderation.

Finally, the Constitution of the State and of the Union gives ample authority to the Legislature and to Congress to correct all evils by the regulation of commerce within the State and between all the States.

In the opinion of your committee the most careful study should be given to this subject by all, and such action taken, from time to time, as will further proper legislation.

A. N. PERRIN,
M. C. BEEBE,
D. H. FORESMAN.

REPORT OF COMMITTEE ON FRUIT CULTURE.

Read at the Annual Meeting, 1882.

Fruit culture, in its broadest sense, embraces so many topics that it is impossible even to refer to them all, in a short report. Its importance to the human family, however, is scarcely second to any other of earth's productions.

From a pecuniary standpoint the real value of fruits embraces millions of dollars;—from a health standpoint their value can hardly be estimated, and from their general beauty it is evident that the Creator intended that man by nature should be attracted by them. There is scarcely a healthy child that will not as naturally take and eat fruit as a duck will take to the water, and if custom and habit would not make man abnormal, fruits would constitute the larger proportion of his diet.

Assuming the foregoing as facts, is there not a wide field for the display of our energies from both pecuniary and philanthropic standpoints?

Since we of the east can no longer successfully compete with those of the west in grain-growing, stock-raising, or dairying, why not embark more extensively in horticulture?

Since fruits and vegetables are more perishable than the general farm products, they almost invariably, in fresh and good condition, find a ready market at remunerative prices at home.

The dependence of our great State upon her neighbors for so large a proportion of horticultural products, is at best humiliating, and more emphatically so, while it has soil, climate, capital, muscle (and we had almost said *brains*) enough to be an exporter instead of an importer of said products.

Why should our State not supply its own cities and towns with berries, grapes, peaches, pears, apples and other products in the same line, when it is evident that it can be done?

As evidence, after such a severe winter as the past, small fruits have done admirably, and need not necessarily be a total failure in any season. While the peach crop was cut unusually short in the bay States as well as in the Keystone State, yet not a few orchards, properly located and well attended, in our State, bore fine crops at remunerative prices.

Grapes were quite a fair crop, pears a full one, and many apple orchards, (although the off year) have fair to abundant crops. At the same time, the unusual heat and drought have caused premature falling and decay.

It is therefore demonstrated that our State has the capacity of being at least *independent*, if it cannot claim a monopoly in horticulture; for the same causes will produce the same effects under the same conditions. For instance, if one strawberry patch will yield a good crop, any other patch with similar soil, location and management, will bring similar results;—the same with peaches, pears, apples, or any other crop.

It must not be forgotten, however, that success in horticulture, like any other occupation, requires judgment. close observation, and attention.

A proper selection of soil and location, and choice of varieties of fruit is of first importance;—planting must not be done in a slipshod manner;—pruning and training properly is not child's play. The common notion and practice of trying to produce full fruit and field crops from the same ground at the same time, for a succession of years, without replenishing the soil, is simply ridiculous.

Neither must the study of entomology be neglected, for there is hardly a tree or crop, whether of fruits, vegetables or cereals, that is not subject to the ravages of some insect. Diseases of a fungoid nature have also become very destructive to plant life.

The above array of drawbacks seems so formidable, as to discourage many who might otherwise be inclined to engage in horticulture. Thanks, however, to a kind Providence who has, at the same time, given to man the means of counteracting said drawbacks, probably for the good of man, for were he not continually stimulated to exertion, he would lapse into indifference and laziness, from which his mental capacity and highest enjoyment would greatly suffer.

We claim further, that man can, to a certain extent, have control of the seasons; for a well-drained soil, properly located, will suffer less in a wet season, than soil of a reverse nature. During a hot and dry season like the present, mulching at the proper time will often secure a crop that would otherwise prove a failure; even frequent stirring the surface of the soil during drouth is a great benefit to growing crops. Trees which suffer from the effect of cold dry winds, and in many cases die, might be saved by thoroughly saturating the soil as far as their roots extend, before winter sets in.

Therefore, continuous vigilance is the price of success in this as well as in other enterprises.

When we are apprised of the resources of our great State, and the means at our hands to develop them, it seems to us almost criminal neglect to permit them to lie dormant, especially when we see some of our sister States, with horticultural resources not superior to ours, pocketing tens of thousands of dollars annually from us, for fruits and vegetables, which we might as well pocket ourselves.

The foreign demand for winter apples has increased amazingly since the late war, the exports amounting to many thousands of dollars annually, and the demand (both home and foreign) for fruits evaporated by the newer processes has increased even in greater ratio. There are in our State large areas of waste lands, besides thousands of acres which scarcely pay for cultivation, that may be made remunerative to their owners by judicious planting of fruits, and their proper management.

Persons wishing to plant fruits should observe closely what kinds and varieties succeed well in their own vicinity, and on similar soils, and plant only such in quantity. At the same time other popular kinds should be planted, a few each for testing. By following such a course, no one will go far amiss in his selections. The new and improved fruits which are continually being brought out for dissemination, should, indeed, stimulate to more-extensive planting.

To grow fruits for profit, their successful production is not all that is required, for some seasons a large proportion is left go to waste, therefore their proper utilization is of vital importance.

The improvements in fruit-preserving houses, improved methods of evaporating, converting into jelly, canning, besides other methods to utilize fruits, should certainly stimulate to more extensive enterprises to plant for profit. But, suppose one has an orchard bearing an undue proportion of early summer or early fall apples, how can he best secure the most profit from a crop now almost valueless from the lack of a good market? Why, let him avail himself of the present greatly improved methods of evaporating as used in the best evaporating establishments. Or, if he prefers winter apples, he can, by grafting and careful after-attention, have, in less than five years, his summer trees bearing winter apples.

Should this State Board of Agriculture be instrumental in the consummation of the above ideal in the near future, and the balance of the fruit trade turn in favor of our State, instead of against it, your committee will feel fully compensated for its exertions.

H. M. ENGLE,
DAVID WILSON,
J. S. KELLER,
F. R. MILLER,
J. A. HERR.

REPORT OF THE COMMITTEE ON GRASS AND GRASSES OF PENNSYLVANIA.

In presenting to the Pennsylvania Board of Agriculture, and through the published reports of that body, to the people of the State, the final report of the Committee on "Grass and Grasses of Pennsylvania," we have to express our regret that the work of the committee has not been as fruitful in results, in some respects, as was hoped for in the outset. Taking into consideration the immense money value of the annual grass crop of our State, the vast area of our mowing and grazing lands, the manifold products into which the crop finally enters, and the important place it holds in the whole economy of our agriculture; and then considering the facts as they appear from the investigations of your committee, some of which were, indeed, already well known, and the feeling is one of surprise, that a subject so important in an economic view, and so interesting in its scientific aspects, should not have received more general attention.

The work attempted by your committee, was 1, To secure if possible a more full and accurate report of the grass crop of the State, than had yet been accessible to our people; 2, To secure a full list of the various species of grasses cultivated in each county in the State; 3, To get as full a list as possible of the wild or natural grasses of the State, and of the various localities in which they were distributed. With this object in view, the committee had about three hundred circulars printed, and in June and July last sent them out, mostly to members of the Board and the official reporters appointed by the members of the Legislature, sending from three to five into every county of the State. The following is a copy of the circular.

" The committee on " Grass and Grasses of Pennsylvania," appointed by the State Board of Agriculture, respectfully request, that in order to facilitate the collection of statistics concerning the grasses, and grass lands and crops of the State, you will furnish as complete answers as possible to the following questions. Members of the Board receiving additional copies of this circular, are requested to distribute them to such persons in their county as will be likely to take an interest in the matter. Specimens of grasses for name, may be sent to Mr. W. R. Shelmire, Avondale, Chester county, Pennsylvania."

1. What is the estimated acreage annually mown for hay, in your county? 2. What is the average annual quantity of hay cut per acre? 3. What is the average value of hay, per ton? 4. What is the estimated number of acres, in your county, annually used wholly for pasture? 5. What is the annual value of pasturage per acre? 6. What varieties of grasses are sown for hay? 7. What varieties of grasses are sown for pasturage? 8. What varieties of grasses, other than those sown for meadow or pasture are found growing in your county? Please give a full or partial list."

In response to these inquiries, answers were received from about one hundred correspondents, representing all but nine of the counties in the State. The following is the substance of the reports received, in answer to questions one. two, three, four, and five, which for convenience we have arranged in tabular form.

COUNTIES.	Estimated number of acres mown.	Per cent. of cleared land mown.	Tons hay per acre.	Average value of hay per ton.	Estimated number of acres pastured.	Per cent. of land pastured.	Annual value of pasture per acre
Adams,	74,000	....	1¼	$9 50	...	16	$4 00
Allegheny,	.....	33	2	14 00	25,000	....	6 00
Armstrong,	....	....	1	13 00	10 000	....	12 00
Beaver,	18.000	.....	1	9 00	29,000	...	3 00
Bedford,	72,000	.....	1½	8 50	.....	10	4 00
Berks,	....	..	...	13 00			
Blair,	....	25	1¼	12 00	Very little,	.....	3 00
Bradford,	160,000	...	1½	10 00	220,000	..	3 50
Bucks,	......	33	1½	15 00	......	16	13 00
Butler,	....	20	1½	10 50	....	20	3 00
Cambria,	....	25	1½	12 00	....	25	4 00
Cameron,	3,500	.....	1	15 00	1,000	....	3 00
Carbon,	....	......	½	20 00			
Centre,	....	25	1½	12 00	...	5	5 00
Chester,	120,000	...	1¼	15 00	75,000	....	15 00
Clarion,	......	20	1¼	13 00	....	16	4 00
Clearfield,	....	....	1	15 00	Very little,	......	2 00
Clinton,	....	20	1¼	15 00	....	5	4 00
Columbia,	..	20	1¼	12 50	......	10	3 00
Crawford,	111.000	.....	1	9 00	165.000	....	2 00
Cumberland,	100,000	...	1¼	10 25	20,000	.....	6 00
Dauphin,	...	33	1½	15 00	.....	20	5 00
Delaware,		33	1	18 00	....	33	20 00
Elk,	10 000	....	1	17 00	5,000	....	3 50
Erie.							
Fayette,	....	25	1½	9 00	....	25	4 00
Forest.							
Franklin,	....	20	1	10 00	....	16	6 00
Fulton,	..	25	1	14 00	....	20	
Greene,	75 000	....	1	10 00	150.000	.....	3 00
Huntingdon,	25,000	....	1	10 00	Very little.	....	2 00
Indiana,	....	25	1½	10 00	....	25	5 00
Jefferson.							
Juniata,		25	1	8 00	.	10	
Lancaster,	65,000	....	1½	15 00	25,000	...	12 00
Lawrence,	.....	20	1½	8 00	.....	5	2 00
Lebanon,							
Lehigh,	30,000	......	1	15 00	20.000	....	10 00
Luzerne,							
Lycoming,	....	......	2	12 00	....	......	10 00
Lackawanna,	....	......	1	12 00			
McKean,	9 000	......	1	12 00	*20,000	....	4 00
Mercer,	....	20	1¼	10 00	....	20	2 50
Mifflin,	....	30	1½	18 50	....	15	8 00
Monroe,							
Montgomery,	40,000	....	1¼	18 00	....	20	9 00
Montour,	....	20	1½	12 00	None.		
Northampton,	33,500	......	1	16 00	20,000	....	5 00
Northumberland,	......	25	1	16 00	....	15	3 00
Perry,	....	20	1¼	11 00	....	15	5 00
Philadelphia,	....	....	1½	20 00			
Pike,	....	33	¾	12 00	....	35	5 00
Potter,	15,000	....	1½	8 00	20,000	....	5 00
Schuylkill,							
Snyder,	......	35	1	13 50	....	20	10 00
Somerset,	....	10	1½	10 00	....	25	1 50
Sullivan,							
Susquehanna,	100,000	.....	1	8 00	130,000	......	2 50
Tioga,							
Union,	..	12	¾	10 00	Very little.	......	3 00
Venango,	40.000	....	1	10 00	120,000	.....	2 50
Warren,	50,000	..	1¼	10 00	60 000	.....	2 50
Washington,	...	20	1½	9 00	....	50	3 00
Wayne,	....	33	1¼	9 00	....	45	2 50
Westmoreland,	....	10	1¼	10 00	....	33	3 50
Wyoming,							
York,	80,000	......	1½	14 00	10,000	......	10 00

* Including woodland.

In making up the above table, where there were two or more correspondents from a county, the average has been taken in cases where the estimates given were not the same. The answers returned in reply to questions one and four, being in some cases in acres, and in others in percentages of cleared or cultivated land, render it difficult to present the totals for the State. Twenty-four counties report estimate of number of acres actually mown.

Twenty-nine counties report percentage of cleared land mown. Averaging by counties, the quantity of hay cut per acre, in fifty-six counties, is one and one fourth tons. By the same method, the average value of hay per ton, in fifty-seven counties, is $12 25. The percentage of land mown in the twenty-nine counties thus returned, is twenty-four per cent. Nineteen counties report estimate of number of acres annually pastured. Twenty-eight counties report percentage of land pastured. Averaging by counties, the annual value of pasturage per acre, in fifty counties, is $5 35. The percentage of land pastured in the twenty-eight counties thus returned, is about twenty-three per cent. As several correspondents have referred us to the Census Reports for the information asked for, we submit the following letter:

WASHINGTON, D. C., *October 2, 1882.*

N. F. UNDERWOOD, ESQ., *Lake Como, Wayne county, Pa.:*

SIR: In reply to your letter of the 29th ulto., I regret to have to say that the statistics of hay for Pennsylvania, or for any other State, are not yet compiled.

Very respectfully,

C. N. SEATON,
Superintendent of Census.

QUESTION 6. What varieties of grasses are sown for hay?

Adams—Clover and timothy, with a small amount of Hungarian and orchard. *Allegheny*—Timothy and clover, together or separately; some Hungarian. *Armstrong*—Clover and timothy. *Beaver*—Clover and timothy. *Bedford*—Timothy, clover, some Hungarian. *Berks*—Clover and timothy. *Blair*—Timothy, red clover, orchard, Kentucky blue grass. *Bradford*—Clover and timothy. *Bucks*—Timothy and clover, mainly. Some herds and orchard, millet and Hungarian. *Butler*—Timothy, clover, blue grass, orchard. *Cambria*—Timothy and clover, some orchard. *Cameron*—Clover and timothy. *Carbon*—Clover and timothy. *Centre*—Clover and timothy, Hungarian, some orchard. *Chester*—Timothy, clover, Hungarian, herds, green grass, orchard, rye grass, with a little alfalfa and alsike clover. *Clarion*—Timothy, clover. orchard, Hungarian. *Clearfield*—Timothy, clover, Hungarian. *Clinton*—Timothy, clover, some Hungarian, and red top. *Columbia*—Timothy, clover, Hungarian, orchard, some German millet. *Crawford*—Timothy, clover, red top, orchard. *Cumberland*—Clover and timothy, almost exclusively. *Dauphin*—Clover and timothy; a littled red top in low meadows. *Delaware*—Clover and timothy. *Elk*—Timothy, clover, red top. Some are introducing orchard grass. *Erie*—Not reported. *Fayette*—Timothy and clover; some little orchard grass, *Forest*—Not reported. *Franklin*—Timothy, clover, Hungarian *Fulton*—Timothy, clover, large and small. *Greene*—Timothy and red clover. *Huntingdon*—Timothy and clover, almost universally. Occasionally orchard grass, with a little Hungarian. *Indiana*—Timothy and clover, some red top, blue grass, orchard, millet, and Hungarian. *Juniata*—Clover and timothy, generally mixed. *Jefferson*—Not reported. *Lancaster*—Timothy, clover, herds, orchard, red top, green grass, some Hungarian. *Lawrence*—Timothy and clover. *Lehigh*—Timothy and clover. In some years Hungarian is sown. *Lycoming*—Timothy and clover. *Lackawanna*—Timothy and clover. *Lebanon*—Not reported. *McKean*—Clover and timothy. *Mercer*—Timothy and clover: *Mifflin*—Timothy, clover, orchard, Hungarian, some German millet. *Montgomery*—Timothy, clover, and herds grass, principally. Some orchard and

Hungarian. *Monroe*—Not reported. *Montour*—Timothy and clover. *Northampton*—Clover, timothy, orchard, herds grass. *Northumberland*—Timothy and clover. *Perry*—Timothy and clover. In some few instances red top, on marshy lands. *Philadelphia*—Timothy and clover. *Pike*—Timothy and clover only. *Potter*—Timothy and clover, generally mixed. *Schuylkill*—Not reported. *Snyder*—Clover and timothy. *Somerset*—Clover and timothy. *Susquehanna*—Timothy, clover, medium and peavine, red top, orchard. *Sullivan*—Not reported. *Tioga*—Not reported. *Union*—Clover on grain rotations, and timothy as reserve, in case the clover fails to catch. *Venango*—Timothy, clover, orchard, red top, blue grass, white clover; also all the millets. *Warren*—Timothy, clover, red top, orchard. *Washington*—Timothy and clover. Some have tried orchard; a few alsike clover. *Wayne*—Timothy, clover, sometimes orchard, alsike clover, and white clover. *Westmoreland*—Timothy and clover. *Wyoming*—Not reported. *York*—Clover, timothy, Hungarian, red top.

QUESTION 7. What varieties of grasses are sown for pasturage?

Adams—Clover and timothy. *Allegheny*—Clover and timothy, some orchard, blue grass, and alfalfa. *Armstrong*—Clover, timothy, orchard, blue grass. *Beaver*—Pasture old meadows. Run into blue grass, red top, and white clover in about three years. *Bedford*—Timothy, clover, Hungarian, some percentage of blue grass and orchard. *Berks*—Clover, principally. *Blair*—None whatever. Land sown to timothy and clover; runs into blue grass in about three years, and this makes the pasture. *Bradford*—Timothy, clover, large and small. *Bucks*—Clover, timothy, herds. *Butler*—Clover, timothy, blue grass, orchard. *Cambria*—Timothy and clover. *Cameron*—Clover and timothy. *Carbon*—Not reported. *Centre*—Clover, timothy, orchard. *Chester*—Timothy, clover, green grass, orchard. *Clarion*—Timothy, clover, orchard, blue grass. *Clearfield*—Timothy, clover, red top. *Clinton*—Timothy, clover, some orchard. *Crawford*—Clover, (red and white,) timothy, red top, orchard, some blue grass. *Cumberland*—Usually clover. Our pasure lands are mostly meadows, on which blue grass grows spontaneously. *Columbia*—Timothy, clover, some orchard. *Dauphin*—Clover, timothy, red top. *Delaware*—No grasses are sown for pasturage especially; but, after mowing a couple of years, the stubble ground is so used. *Elk*—Timothy, principally; some little orchard grass. *Erie*—Not reported. *Fayette*—Timothy, clover, orchard, some little blue grass. *Forest*—Not reported. *Franklin*—Clover generally. *Fulton*—Timothy and clover. *Greene*—Timothy, clover, Kentucky blue grass. *Huntingdon*—Clover mostly, some timothy. *Indiana*—Timothy and clover, red top, blue grass, white clover. *Juniata*—Not reported. *Jefferson*—Not reported. *Lancaster*—Timothy, clover, herds, orchard, red top, green, rye and oats. *Lawrence*—Timothy and clover. *Lehigh*—Timothy and clover. *Lycoming*—Timothy and clover. *Lackawanna*—Timothy and clover. *McKean*—Clover, timothy, red top, blue grass, orchard. *Mercer*—Timothy, clover, blue grass, orchard, some red top. *Mifflin*—Timothy and clover, orchard, blue grass. *Monroe*—Not reported. *Montgomery*—Usually timothy and clover, when, after a time, the natural grasses come in, mostly white clover, green grass, and the common meadow grass. *Montour*—None. *Northampton*—Clover and timothy. *Northumberland*—Timothy and clover. *Perry*—Timothy and clover, some little blue grass, and occasionally millet. *Philadelphia*—Land too valuable for pasture. *Pike*—Timothy and clover. *Potter*—Timothy and clover, when any are sown. *Snyder*—Clover and timothy. *Somerset*—Clover and timothy. *Schuylkill*—Not reported. *Sullivan*—Not reported. *Susquehanna*—Timothy and clover mainly, some blue or June grass *Tioga*—Not reported. *Union*—No perpetnal pasturage in ordinary farming. When clover is partly fed off, the rest is usually turned under. *Venango*—Usually the same as for hay. Blue grass and white clover come up spontaneously. Lately a few are sowing orchard and blue grass, for pasture more particularly. *Warren*—Timothy and clover, principally. *Washington*—Timothy, clover, blue grass, some orchard. *Wayne*—Timothy and clover, principally. *Westmorelond*—Timothy and clover; a very little red top and blue grass. *Wyoming*—Not reported. *York*—Same as for hay.

QUESTION 8. What varieties of grasses, other than those sown for meadow or pasture, are found growing in your county?

Adams—Blue glass, red top, white clover. *Allegheny*—Red top, joint grass, white clover. *Armstrong*—Red top, fowl meadow grass. *Beaver*—Foxtail, wire grass, chess, blue grass, red top, white clover. *Bedford*—Red top, spear grass, sour grass, white clover. *Berks*—Hungarian, orchard. *Blair*—Blue grass, white clover. *Bradford*—Blue grass, red top, couch grass, barn-yard grass, white clover. *Bucks*—Green or June grass, blue grass, sweet scented vernal, fall grass, white clover *Butler*—Red top, woods grass, white clover. *Cambria*—White top. *Cameron*—Red top, swamp grass, white clover. *Carbon*—Not reported. *Centre*—Blue grass, foxtail or fall grass, spear grass, white clover. *Chester*—See botanical list. *Clarion*—Red top, white clover, spear grass, fall grass, white clover. *Clearfield*—None reported. *Clinton*—Blue grass, spear grass, swamp grass, fall grass, white clover. *Columbia*—Red top, white top, silver top, blue grass, summer grass, white clover. *Crawford*—Meadow foxtail, white top, blue joint, June grass, spear grass, wood meadow grass, meadow fescue, oat grass, wire grass, chess. *Cumberland*—The usual varieties found on limestone and slate; not very numerous. *Dauphin*—Blue grass, white clover. *Delaware*—Our natural grass very much resembles the Kentucky blue grass, with the exception of a green instead of purple tinge. *Elk*—Blue grass, green grass, barn grass, knot grass, swamp grass, white clover. *Erie*—Not reported. *Fayette*—Red top, foxtail, spear grass. *Forest*—Not reported. *Franklin*—Blue grass, red top. *Fulton*—Blue grass, red top. *Greene*—Red top, June grass, blue grass, (native) foxtail, white clover. *Huntingdon*—Blue grass, red top, spear grass, foxtail, several swamp grasses. *Indiana*—Green grass. *Juniata*—None reported. *Jefferson*—Not reported. *Lancaster*—Swamp, meadow, hair, fescue, sweet vernal, millet, blue grass, feather grass, foxtail, spike grass, wood grass, white clover. One collection, that of Mrs. Thomas Baker, contains thirty-nine different species. *Lawrence*—Blue grass, red top, white clover, and the common swamp grasses. *Lebanon*—Not reported. *Lehigh*—Can give no particular names, perhaps a dozen kinds or more. *Lycoming*—Am not familiar with the names. *Luzerne*—Not reported. *Lackawanna*—Red top. *McKean*—Am unable to answer. Many kinds of wild grasses are found here, mostly of no value. *Mercer*—Principally white clover. *Mifflin*—Spear grass, red top, and some other varieties that I am not able to name. *Monroe*—Not reported. *Montgomery*—Blue grass, green grass, turkey-foot, wire grass, &c. *Montour*—Red top, generally found in old meadows. *Northampton*—Hungarian and millet. *Northumberland*—Blue, orchard, red top, meadow, sour grass. *Perry*—Do not know of any other grasses worth mentioning, unless it would be a very fine thing called "moonshine." *Philadelphia*—None reported. *Pike*—Red top blue joint, feather grass, and what is called flats grass. *Potter*—June grass, red top, white clover. *Snyder*—Ten or a dozen different kinds of natural grasses; cannot name them. *Schuylkill*—Not reported. *Somerset*—Blue grass, red top, white top, sweet vernal, rye grass, glade and marsh grass, foxtail, white clover. *Sullivan*—Not reported. *Susquehanna*—Swale grass, sweet vernal, fowl meadow, quack, white clover. *Tioga*—Not reported. *Union*—Some orchard, quack or knot, red top, swale grass, white clover. *Venango*—Poverty, rye, witch, quack, pigeon, June, &c. We are infested with sorrel this season. Can the Board give us a remedy? *Warren*—Red top, white top, June, quack, white clover, swamp and marsh grasses, with an almost endless amount of what is called crab grass. *Washington*—Red top and a species misnamed "poverty." *Wayne*—See botanical list. *Westmoreland*—Blue grass—two varieties, extensively spread, white clover, and a number of others, names not known. *Wyoming*—Not reported. *York*—Blue grass, meadow grass, white clover.

Botanical list of grasses found in Chester county, furnished by Mr. Warren R. Shelmire, Avondale, Chester county, Pennsylvania:

Leersia Virginica,
" oryzoides,
Phleum pratense,
Vilfa Aspera,
Agrostis vulgaris,
" alba,
Cinna arundinacea,
Muhlenbergia diffusa,
" mexicana,
" sobolifera,
Eleusine Indica,
Tricuspis sesleroides,
Diarrhena Americana,
Dactylis glomerata,
Eatonia Pennsylvanica,
Glyceria nervata,
Poa annua,
" pratensis,
" alsodes,
" serotina,
" compressa,
" trivialis,
" sylvestris,
Eragrostis Purshii,
" poaeoides,
" pectinacea,
Setaria viridis,
" glauca,
" Germanica,
" Italica,
Tripsacum dactyloides,
Festuca elatior,
" nutans,
Bromus secalinus,
" racemosus,
" ciliatus,
Uniola latifolia,
Lolium perenne,
Triticum repens,
Elymus Canadensis,
Danthonia spicata,
Holcus lanatus,
Anthoxanthum odoratum
Phalaris arundinacea,
Paspalum Laeve,
" setaceum,
Panicum filiforme,
" sanguinale,
" anceps,
" agrostoides,
" proliferum,
" capillare,
" latifolium,
" clandestrinum,
" dichotomum,
" viscidum,
" pauciflorum,
" crus-galli,
Erianthus ravenna,
Andropogon furcatus,
" Virginicus,
Sorghum nutans,
Gynericum argentum,

The following is a partial list of grasses found in Wayne county, mostly reported by Professor John M. Dolph, Principal of the Honesdale Graded School, Honesdale, Wayne county, Pennsylvania.

Alopecurus pratensis,
" geniculatus,
" aristulatus,
Phleum pratense,
Agrostis vulgaris,
" scabra,
" alba,
Calamagrostis Canadensis,
Cynodon Dactylon,
Eleusine Indica,
Briza media,
Bromus secalinus,
Uniola latifolia,
Tritticum repens,
Danthonia spicata,
Holcus lanatus,
Anthoxanthum odoratum,
Phalaris canariensis,
Panicum sanguinale,
" capillare,

Tricuspis sesleriodes,
Dactylis glomerata,
Glyceria Canadensis,
" aquatica,
Poa annua,
" compressa,
" serotina,
" pratensis,
Panicum virgatum,
" crus-galli,
Setaria glauca,
" viridis,
Sorghum nutans,

From the foregoing it will be seen that the answers to questions six and seven present a full showing, so far as the fifty-seven counties reported are concerned, of the various species of grasses sown for meadow and pasture throughout the State. The most noticeable fact presented, is the prominent place which "timothy and clover" hold, in the lists given, both for mowing and grazing. Whether our farmers do well to confine their seeding so closely to these two, is a question which they may well seriously consider. Timothy and clover seed are everywhere standard articles of trade, and this, together with established usage, has much to do with maintaining their exclusive use. We would by no means discard them, but rather add to them such other species as seemed best adapted to the locality. The quite common custom of seeding land intended for permanent pasture with timothy and clover, and waiting for the natural grasses to "run in," seems open to the objection that as "timothy and clover" retire, which they soon do, a fight for possession takes place between the natural grasses and thistles, sorrel, and other weeds, whose seeds have been waiting for their opportunity. The blue grass, red top, white clover, &c., may come out ahead, but why not sow the seeds of these, and give them possession at once, and thus secure good pasture from the start. We mention these species simply because they are among those usually found in possession after the field has been left open for "the survival of the fittest."

The answers to question eight, while they show that many species of the natural grasses are widely distributed over the State do not give that exact information which your committee hoped to secure. With a botanical list returned from but a single county, the conclusion is inevitable that the information sought, under this head, cannot be obtained in this way, and this for the obvious reason that very few of our people have given the subject any attention. However valuable the publication of a full list of the grasses of the State, and their local distribution might be to agriculturists or others, it would seem that, for the present, it is a work that must wait. That it is a work well worth the doing, all will admit who have given the matter even limited consideration. How it can best be done, is not within the province of this committee to determine. That when done, it will be largely an individual work, seems likely from the facts presented.

We will only say, in conclusion, that if the farmers of our own State will make the grasses one of their subjects of special study and observation, we are sure it will contribute greatly both to their pleasure and profit. In doing this, the help of a good work upon this subject, with colored illustrations, would be of great value; but we regret, that so far as we are aware, no such work is at present published in America. Such a work would be costly to publishers and purchasers, but it ought to be sufficiently well sustained to make its publication remunerative. Doubtless such a work will be forthcoming whenever the popular demand will warrant it. In the mean time, "Gray's New Manual of Botany," and the special work upon grasses of Mr. John Henderson, of Northport, Long Island, may be recommended as the best American helps that have come under our notice.

The grass of the field, in its green or dried state, will continue in the future, as it has in the past, to furnish the great bulk of the food of our herds and flocks, and the progressive agaiculture of our time demands that we avail ourselves of the best that nature has placed within our reach. Whatever place the soiling system and the silo may occupy in the agriculture of the future, the day is yet distant when the old fashioned hay mow, with its fragrant odor, will be supplanted by the reeking pit, or the herd of the dairyman be driven from the verdant hillsides, cooling shades, and sparkling springs of pasture land, to swelter away the summer days in stifling stables.

To the numerous correspondents who have assisted in the collection of the statistics here given, we return our sincere thanks.

All which is respectfully submitted in behalf of the committee.

N. F. Underwood, *Chairman*,
H. L. Scott,
M. W. Oliver,
E. Reeder,
F. R. Miller,
W. R. Shelmire,
J. S. Keller,
J. McDowell.

THIRD ANNUAL REPORT OF THE COMMITTEE ON SILK INDUSTRY.

Your committee, in presenting their third annual report, are pleased to be able to state that the evidences are abundant that the subject of silk growing is taking a firmer hold on the attention of our people. The silk industry has steadily progressed during the year, and the indications all point toward a hopeful out-look for the future.

The work done by and through the "Women's Silk Culture Association," 1320 Chestnut street, Philadelphia, has been the principal agency for the development of a widely increased interest in the practical experimental efforts at silk growing.

Through it have extensive supplies of cocoons, eggs, mulberry trees, and the necessary fixtures and instructions for the details of the work been distributed all over the land. And from this center have sprung up a number of kindred associations, each of which is a nucleus for the spread of interest and instruction.

The North American Silk Exchange, No. 29 Bond street, New York; the Silk Association of California, at San Francisco; the Industrial Academy at Huntsville, Alabama, under the conduct of Samuel Linsey, a colored man, who is instructing his race in the South in silk growing; the Corinth Silk Company, at Corinth, Miss., and a similar one at Aberdeen, Miss.; a woman's silk culture association just started in Lousiana; the efforts of Dr. G. H. Larison, at Lambertville, New Jersey, and others, are outgrowths of the benevolent efforts of the Philadelphia society.

While they have thus been enlarging the field of their work, they have also devoted much time and cost to the perfection of the *methods* for producing and preparing the silk for market.

By the offer of liberal premiums, for the best machinery, they have secured the construction of a metal *reel*, the invention of Mr. Hugo Bilgram, a member of the Franklin Institute, which is far superior to the old wooden reel in general use. It is a light, easy, and rapid running reel, and seems to embody all the requisites of a hand reel. With it a skillful operator can secure a much larger per cent, of silk from the cocoons than with the old reels, and at a more rapid rate; a fact that must have a very important bearing on the question of hand reeling with profit. On this there has been reeled a pound of silk from less than four pounds of cocoons, although it is asserted that with old methods as much as twelve pounds have been used to produce one pound of silk.

These results have been secured from the use of experimental lots of cocoons, gathered promiscuously, generally in small lots, from several states of the Union, and yet the reeled silk has been pronounced by some of the most reputable and extensive manufacturers and dealers in silk as *equal to the best raised in any country in the world.* Lorin Blodgett, perhaps the best authority on textiles in this country, says of these productions that " he has examined them critically on many occasions, including the microscopic tests, a form of examination which shows the precise character of the fiber, and all the silk produced by the Ladies' Association is equal, and much of it superior, to that imported as the best Italian." " I will guarantee that were the same number of fibers are reeled from the cocoon, in forming the raw silk reeled here, taking an average of the specimens, that the fabric ultimately produced, will weigh heavier in dress goods, or in handkerchiefs, than if made of the same number of cocoon fibers sent here as Italian."

If then, these early trials, by unskilled amateurs, has resulted in such marked success, what may we not expect when established as a fixed industry.

In their second annual report, the W. S. C. Association say, after reciting some of the instances of interest awakened, and the extension of their field of operation. " Thus, year by year, the work must grow, slowly, surely, until it has taken deep root and become a leading industry, like its more homely, but gigantic compeers, *wool* and *cotton.* We have the market, the demand, the climate, all we wait for is the growing of the trees, the training and tested experience of our young people, and the filature."

" Time will bring all these branches into public observation and favor, and we shall accomplish our aims if *aided* ; we press on, as we have done, avoiding all those shoals of a speculative character, and the desire to grow rich without labor."

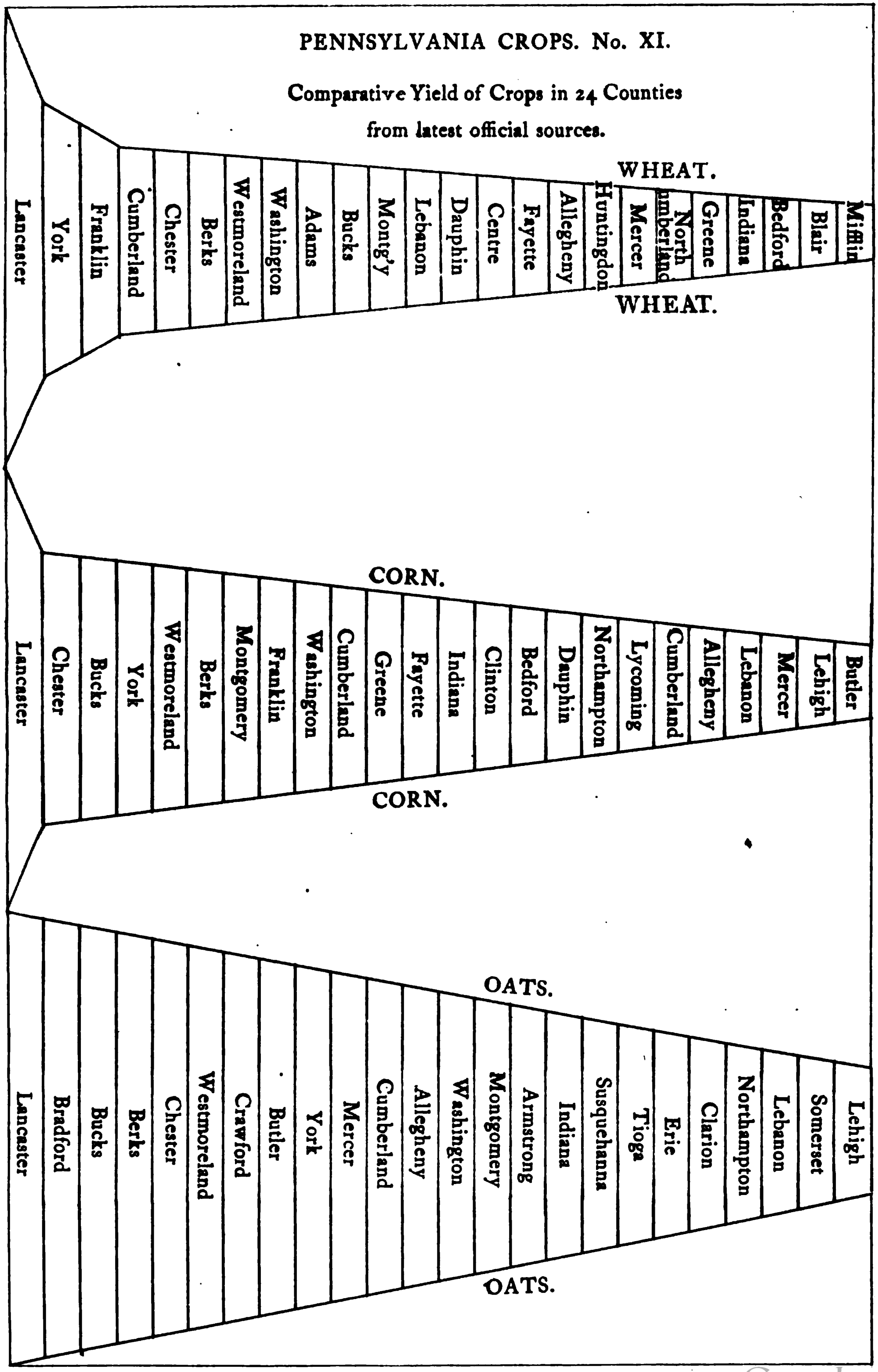
With regard to the cost and labor employed, we have the testimony of those who have engaged in it, " that little outlay is required. Mulberry trees, once planted, are long lived, hardy, and useful for shade ; for beautiful hedges they help, by their symmetry and healthfulness, to add to the beauty of the domain. The labor can be done by the usually unemployed members of the family. There is no field-work required with horses or machinery, and not much labor to be paid for in cash, to " add silk-culture as another auxiliary of the agriculturist's household."

Mr. Blodgett, in the paper already quoted, says : " To-day we produce nearly $300,000,000 in value of raw cotton in the United States, often without profit to the careless planter, but with great profit to the country. I regard the condition of growing silk, as presenting circumstances much more favorable, on the whole, in this country, for reasons very easily stated. Silk raising, where the trees are already grown, does not require any considerable investment of capital,—nothing for the purchase of land, or for fertilizers for the soil,—or for the mules, &c., indispensable to the southern plantation. It can be done by any one or more members of the family who may choose to engage in it. It is not field-work, and therefore not labor to be paid for in cash."

But it has been proven beyond question that the leaves of the osage orange, *Maclura durantica,* when used for feeding the worms will produce as good a quality of silk as that from the mulberry ; a fact that goes far towards the solution of the question of profit. We have the valuable evidence of Professor Riley, the eminent entomologist of the Smithsonian Institute, in support of this fact. He has fed *seven successive* generations

PENNSYLVANIA CROPS. No. XI.

Comparative Yield of Crops in 24 Counties
from latest official sources.



of silk worms with the osage leaves, and assert that no apparent degeneration of health or fecundity has resulted, and what is better, he asserts that the silk product in his possession, and some of which is displayed at the museum of the institute, is equal in quality with the average produced from the mulberry.

A number of persons during the season of 1881, fed silk worms on the osage, as the request of the Women's Silk Culture Association. The cocoons resulting were reeled and submitted to such tests as were required to determine if the silk was as good or equal to that produced from the White or Italian mulberry, the standard of excellence.

At the exhibition held at St. George's Hall, in February last, Mrs. Dr. Van Dusen presented to the association eighteen ounces of cocoons raised from the osage leaves. Six and one half ounces was the result of reeling, a high average. This was given to a well known silk manufacture of Philadelphia, who at once put it into organzine and tram, and dyed it a beautiful crimson, and then wove it into twenty yards of ribbon. The following note will explain the result:

[Copy.]

712 MARKET ST., PHILADA.,
April 5, 1882.

LADIES OF THE SILK ASSOCIATION: We present you with twenty yards of ribbon, made from silk raised on osage orange leaves. *We see no difference in the dying or weaving from other silks.*

Yours respectfully,
WERNER ITSCHNER.

Perhaps the most noteworthy act of the women's association of the year, was the using of some fifty pounds of the earliest cocoons collected for the manufacture of a dress patern, to be presented to the wife of the then President, Mrs. Garfield. Through the generous kindness of Hamil & Booth, extensive silk manufactures of Paterson, New Jersey, a most beautiful fabric was produced, and which was pronounced, notwithstanding all the odds to be encountered, as *standing equal to the very best of foreign silk dress goods.*

In addition to this, they have had woven several hundred yards of dress goods, all of which has been purchased by ladies of the association.

It is proper in this report to allude to the fair held at St. George's Hall last winter by the ladies of the Silk Association. It was in every respect a complete and successful venture; surprising all visitors by the extent and variety of samples of raw materials and fabrics of American silk production displayed.

From the seed of the moth to the most elaborate fabric, the whole silk industry was shown. It is pleasant to tell that in a financial way it was also a success, and demonstrated what woman can do when she wills.

Mrs. John Lucas, the president of the W. S. C. A., in a recent note to the writer, tells that they are daily receiving experimental lots of cocoons, ranging from 10 pounds to 100 pounds, for which they pay liberally; and the orders for trees are constantly increasing.

The silk industry is the third in order of the textile class in this country, amounting to $50,000,000, annually manufactured; while $250,000,000 represents the value of cotton, and $300,000,000, the manufacture of woolen and wool mixed goods.

In addition to the $50,000,000, we import in value $35,000,000 of silk goods, making the total of consumption per year $85,000,000. Why not produce the raw material at home, as in the case of cotton and wool? Why shall we stand in the unnatural position of importing, when we have all the conditions required for home production?

Your committee, therefore, desire to express their confidence in the future of the silk industry, and to commend it to the favorable attention of our people, as well as to the fostering care of our legislative assemblies, both State and national, as worthy of their best consideration.

It may not be out of place, in this connection, to revive some old history, bearing on this question.

Early in the colonial days, when the cavalier planters of old Virginia were directing their energies, and devoting the rich virgin soil of her valleys and river deltas, to the growth of tobacco, the English sovereign, James I, prompted, as it would seem, as much by his inveterate hatred of the "weed," the use of which, he said, "brings with it many disorders and inconveniences," as from information that the soil was naturally adapted to the growth of the mulberry, which was native there, gave orders to the Earl of Southampton, his minister for the colonies, to urge the cultivation of the silk-worm in the colony in *preference to tobacco.* In obedience to the royal mandate, the earl sent an express order on the subject to the Governor and Council of Virginia, instructing them to compel the colonists to plant mulberry trees, and also vines.

In pursuance of this order, the Colonial Assembly, as early as the year 1623, or fifty-nine years before William Penn landed on the shores of the Delaware, passed an act directing the planting of the mulberry. And in 1656, or twenty-six years before Penn's advent in America, an act was passed by the Assembly of Virginia, in which it is asserted that as the "culture of silk is the most profitable commodity for the country," a fine or penalty of ten pounds of tobacco shall be imposed on every planter who shall fail to plant at least ten mulberry trees for every one hundred acres of land in his possession. In the same year a premium of four thousand pounds of tobacco was awarded an individual expert, as an inducement to remain in the colony and manage the trade in silk. In the next year, a premium of ten thousand pounds of tobacco was offered to any one who should export £200 worth of the raw material of silk. Five thousand pounds of tobacco was also promised "to any one who should produce one thousand pounds of wound silk in one year."

This system of rewards and penalties was pursued until 1666, when it was decreed that they were unnecessary, "as the success of divers persons in the growth of silk evidently demonstrated how beneficial the same would prove." As showing the extent to which this industry was carried by these baronial colonists, it is stated that a Major Walker, a member of Assembly, produced satisfactory evidence that he had seventy thousand trees growing in the year 1664, and secured the premium. King Charles II is asserted to have worn a robe of Virginia silk at his coronation. Georgia had a similar history in the first half of the following century, and it is a curious fact, that a Georgia lady has, during the past year, by a test trial, shown that a pound of cocoons can be produced at less labor and cost than a pound of cotton.

Much might be added to this review, to show the interest and success of the early settlers in this worthy industry; and it is to be hoped that, under the light shed upon it by the efforts of these devoted women, it will be speedily revived, and become one of the settled employments of our great Commonwealth.

(Signed) JOHN P. EDGE, J. P. BARNES,
E. REEDER, HENRY C. TYLER,
Committee.

The subject being open for discussion—

Mr. Gow. Can this industry be followed in this latitude? The wild mulberry grows in all the valleys and hills of Pennsylvania; the white mulberry is found here. Could the worms be grown here in competition with latitudes further south?

Dr. Edge. If anything, better. You can keep the eggs of the worms from germinating so soon.

Mr. Miller. Does the fiber of the cocoons come off in continuous threads, or is it in pieces? Is the remainder of the cocoons lost?

Dr. Edge. The loose thread of the cocoons—the ravelings—is used for a different purpose; it is put through cards and used as glossed silk. It is not lost. I don't profess to be posted up thoroughly on the practice of reeling silk, but I think the practice is to put five strands—five cocoons—as the first reeling process; that makes a very light thread, but of sufficient strength.

Mr. Gow. There was a good deal of silk raised in this town and county forty-two years ago. An old gentleman here invested considerable money in it. The statement has been made to the effect, that Mrs. Garfield had a silk dress made as the first American silk dress. That is a mistake. We have a gentleman in town who can corroborate the statement, that he had a silk dress made for his wife nearly forty years ago.

Mr. Beebe. Where was it made?

Mr. Gow. His daughter went to Steubenville and learned the art of reeling. It is my impression it was woven at Economy, Pennsylvania.

Mr. Beebe. Is not that silk dress still in existence?

Mr. Gow. I think not. There were a number of ladies here who made silk stockings. The cocoons were taken from here to Economy. I remember Mr. McKennan and others went over and got silk goods.

Dr. Edge. The committee in their report last January, showed that fifty-nine years ago, (two generations,) Pennsylvania silk was raised very largely. In the colony of Virginia it was raised under compulsory laws; they exported large quantities.

Dr. Roland. My impression is that the first silk was manufactured in York or Adams county, in the neighborhood of Littlestown. Two old ladies raised the worms, spun the silk, and manufactured the goods. Their daughters are still carrying it on in that small way.

Mr. Gow. I have some silk that was raised a short distance from this town. At the time spoken of, my mother had a pillow-case of cocoons. It was spun on a common spinning-wheel. Can that industry be made profitable one for women and children who would not otherwise have much to do?

Dr. Edge. Undoubtedly; and without the employment of outside labor. An ordinary farmer's family, without tasking their energies, could produce from three to eight hundred dollars a year. It has been done repeatedly in this country.

Mr. Gow. We have the osage orange; can we utilize the leaves?

Dr. Edge. We have the testimony of Prof. Riley, of New Jersey, who said it had been entirely successful. I have just learned a fact that is so good, that, with the permission of Mrs. Roland, I shall tell it. During the excitement forty years ago, an old carpet-weaver in York gathered up cocoons enough to reel silk enough to produce about two hundred yards of fabric, which he reeled on his rough reel connected with his carpet business, and wove them into fabrics with which he clothed his family. The cocoons which he could not reel, he worked up and spun; from this, his family made stockings. It is not labor in any sense. I know the children near Kennet Square where the ladies, (under the stimulus of the example of the mother of Bayard Taylor, who took the premium of $200 for the best silk produced,) are perfectly fascinated with the interest they have found in tending to these worms.

Mr. Gow. Mr. Jones said there was a school started at Steubenville, where he sent his daughter. She obtained a knowledge of the manufacture of silk. The question arises whether we could educate silk teachers, and make the teaching of this thing a matter of interest among the people.

Dr. EDGE. They have a regular school in Philadelphia. While the Exposition Company existed, they had a portion of the exposition building assigned them. There they had regular instruction in the reeling of it. After the permanent building was closed, the Park Commission very generously tendered these women the use of the German building, and during the past season they had a silk school in that building, in which they gave instruction to large classes in all the departments of producing silk; and through their exertions a large number of ladies and men, too, have become familiar with the practical handling of the worms. Each one of them will be a teacher by example in their neighborhood.

Mr. GROW. I made the suggestion that if there was a possibility of introducing silk culture as a matter of instruction in the common schools, teachers might have an opportunity of teaching their children the science of entomology. They might also teach the art of rearing the worms, and by that means a knowledge of these things could be spread among our people. I hear that that idea is to be carried out. I would call upon the gentleman to tell how.

Dr. EDGE. In regard to that, I merely said that it was my intention to give some instruction to the children of our graded school to enlist their interest. Any of you can do the same thing, especially if you send down to the Women's Association and get a copy of their book of instruction, which costs a dollar. It gives all the instruction for going through the whole performance, everything that is needed. I think if that was done throughout the schools, a very large result would follow.

SILK CULTURE.

By J. P. BARNES, *Member from Lehigh.*

The subject has been discussed in silk congresses by women and men for days and weeks. Societies have been organized having for their aim the advancement and improvement in "silk culture." Prizes have been offered and awarded in most all parts of the United States for stimulating a spirit of emulation among the votaries of silk culture. Questions have been discussed in the congresses before referred to as to the best means of raising raw silk and the propagation of the largest as well as the best cocoons—those yielding most, as well as the most profitable.

Silk industry has become large and is rapidly developing. In all sections of the country silk mills are springing up. The demand for the raw material is daily increasing, and on all sides the question is raised, is it possible for silk culturists in the States to increase the supply of raw silk as to be able in part to supply the constantly increasing demand? Silk mills are now dependent upon their supplies of raw material principally upon importation from China, Japan, and Italy. In these countries "silk culture " is a specialty, and a great many of its people are engaged in it. These are old countries, not much given to agricultural and mechanical pursuits as is this, the great country of the New World. The United States has developed itself in other spheres and occupations. Finery, in so far as " silk culture " is concerned, has not occupied the attention of its citizens much until within a few years past, (although finery in dress silks and satins has not been lacking.) In this regard we have been able to vie with the older countries, Japan and China, and have been paying high duties for years, in order that *our* ladies and gentlemen should not be in the back-ground, nor that it should be said of them that finery was out of their reach. Many years ago, when I was but a boy, there was what might be termed a silk mania among our people, especially was this the case with the people of this and adjoining counties. Some shrewd and designing speculators endeavored to introduce " silk culture." They supplied farmers and others, who were guileless enough to become their dupes, with cuttings of mulberry plants, recommending them as the *ne plus ultra* of plants that must be used in the propagation of the silk worm. This craze was known as the "*morus multicaulus*," and many a man was deceived. It was a general delusion, and ended in its victims discovering finally that they had been the dupes of designing swindlers. Since the subject of " silk culture " is now frequently discussed, I occasionally look back (mentally) to "*morus multicaulus*" times, when I, as a boy, eagerly watched the rapid growth of the mulberry cuttings my father had set out; the development of its large and beautiful foliage. What an interest I took when the silk worm eggs were exposed to a hatching temperature; when the expansion of the worm inside burst open the surrounding wall, and out crept the dimunitive worm in its first age. Then commenced the gathering of tender leaves to feed them with. Their growth was visible from day to day; as they rapidly enlarged in size their demand for food increased, and in their fourth and fifth age quite an effort was required on my part to supply sufficient food to gratify their voracious appetites, more especially for the reason that we had not a sufficient supply of our own raising, and, therefore, I was compelled to go into the country seeking food from the ordinary black mulberry tree wherever it could be found. This stripping of the mulberry tree of its foliage the farmers, in some cases, objected to, and came out with their dogs to drive us away.

At the close of the fifth age of the worm, they spun their cocoons of white and yellow, and supplied me with quite a heap of them, the bulk of which the chrysalis in them was choked or stifled, and others were allowed to take the natural course for the purpose of reproduction.

So far it proved quite a success; but having no market for the cocoons, my career as a silk culturist stopped right there, with the exception of the disposal of some few eggs. This experience was not mine only, but that of a great many others.

At about this same time, a family in this county (I living in Northampton county then) had grown some mulberry trees from the seed. Some years after they procured some silk-worm eggs, raised worms, fed them, and gathered a lot of cocoons, which they reeled, and spun some into sewing-silk; and some into yarn, from which they knit stockings, and many years afterward exhibited the same at the first fairs held by the Lehigh County Agricultural Society.

This enthusiasm over silk culture in a few years had received it quietus in this locality. Laterly, however, the subject has been revived; and Mrs. Lucas, with her silk culturist congress, has gained prominence, and it is again brought to the public attention, not as a " *morus multicaulus* " delusion, but as a vital subject, full of interest, denuded of all deceit and whilom dealings of swindlers and enthusiasts.

Within the last ten or fifteen years, the silk manufacturing industry in America has grown very rapidly from quite moderate proportions to the value of $45,000,000, as shown by the census report of 1880. Silks to the amount of $35,000,000 in value are imported, making $80,000,000 as the value of silk goods entering into consumption in this country for the period of one year.

At the present time, there are two hundred silk-mills in daily operation.

Here at Allentown is located one of the finest silk-mill buildings in the United States. It was built in the years 1880 and 1881, which, in part, is now in full operation, and turns out some of the finest and best silk dress goods manufactured in this country. Its productions compare with those of the old-established factories of Europe.

This building was put up by the citizens of Allentown for the Phœnix Manufacturing Company of Paterson, New Jersey. They have a lease of it for ten years, paying five per cent. per annum on the invested capital. It cost $85,000, including the boilers and engine. For that sum, coupon bonds of the denominations of $100 and $500 have been issued to the subscribers of the building fund, the interest payable semi-annually. The Phœnix Manufacturing Company has the option of paying off these bonds at any time during the ten years, the term of their lease.

This mill is named the Adelaide Silk-Mills of Allentown, Pennsylvania.

Its size is two-hundred and fifty feet long by fifty feet wide. Four stories high, with a two-story extension for offices. A small additional building has since been erected as a lunch-room for the use of the hands employed.

They now employ four hundred and thirty hands, and expect that before the 1st of July next to increase the number to over five hundred.

They employ more girls than boys, the proportion being about two to one. The average of their ages will be about fifteen years. They can earn, on an average, sixty-five cents per day.

The quantity of raw silk now required in the spinning department is, in value, $2,500 per week, and, when the full capacity will have been reached, $3,000 per week will be required. All that silk is sent to Paterson to be dyed, and the bulk of it is used by the Paterson mills to weave into all sorts of fancy fabrics. The plain goods are exclusively made here.

They are now running thirty weaving looms, and by next fall they expect to have one hundred and twenty-five looms in operation. This number of looms will produce from nine thousand to ten thousand yards of silk per week.

They find the help very intelligent, attentive to their work, and submitting readily to the discipline of factory life.

I learn through circulars issued by the Woman's Silk Culture Association that raw silk commands from four to six dollars per pound, according to its quality. Cocoons from ninety cents to one dollar per pound.

This association is expected shortly to distribute circulars throughout the country notifying growers of silk cocoons of its willingness to purchase their product. And they also intend to offer premiums to the growers of the ten largest amounts of cocoons, quantity and quality being considered. The Woman's Silk Culture Association of the United States—located southwest corner of Juniper and Chestnut streets, Philadelphia, is doing all within its limited power to encourage and induce the people of the United States to take hold of this enterprise. They have rooms in which they teach all branches of silk culture, with a view of introducing it into families throughout the rural districts as a domestic industry.

The aim of the association is to establish a home production and a home market for the sale of cocoons and raw silk, which will encourage families in the country, especially the women and children, to take hold of an occupation that will occupy them pleasantly and at the same time partially remunerate them for a light service of but a few months during the summer season, in raising cocoons. And should they afterwards wish to make further advance in preparing raw silk, they can obtain instructions and reel the silk of the cocoons into hanks, thereby earn an additional remuneration for the services thus rendered.

The first essential necessary to starting in silk culture is the planting of mulberry trees or cuttings, cuttings of young shoots, even to two years old, if taken off in the fall of the year and put away carefully, will take, root easily the following spring. In twelve months the young plants will be well rooted and ready for transplanting in nursery rows, and the following season, if the conditions are favorable, they will have advanced sufficiently for permanent planting. The kinds to be planted must be governed by the latitude you reside in. In a southern or warm climate a tender kind can be used to the best advantage, and *vica versa*, hardy varieties must be planted in a colder or northern climate.

A few of the kinds, and their varieties adapted to silk culture, are the morus alba, (white mulberry.) It has generally superseded all other kinds in this country, for the feeding of silk worms. It has sound wood, beautiful leaves, and sweet fruit, and is useful as well as ornamental.

There are many varieties of morus alba, that may be used for the feeding of silk worms; but the variety called multicaulus is considered the best, both in France and Italy. This variety does not answer for the northern climate, where it is often frozen to the ground during the winter. In the south it would probably be the most profitable variety to cultivate, and there it might require more than ordinary care in its cultivation.

The moretti elata does not generate by seed, as some other varieties do, but withstands the most severe winter, and is best adapted to the north. It is straight, with an elegant shape and luxuriant foliage, and proof against almost any kind of vermin, which destroy so many kinds of trees in this country. It is said to give one pound of cocoons to every fourteen pounds of leaves.

Morus Japanica, or Japanese mulberry tree, has large leaves, gives the same amount of silk as the moretti. It is easily picked. It stands well hard winters, which has been proved by five years' growth in Kansas, if well cared for. General Oliver, of Bear Creek, Luzerne county, Pa., has set out one thousand mulberry trees on his farm, with a view to raising silk worms. This is a commendable step, and I hope it will be followed by others in our State. Mulberry trees planted for feeding silk worms, should be planted in good soil. Rapid growth is necessary, thereby supplying food for the silk worm much sooner and more tender than if planted in poor, neglected soil.

After the trees have advanced sufficiently to provide food, the silk worm eggs must be placed in a temperature of air sufficiently warm to hatch them. The temperature should be about that of 70°, and gradually increased during several days to that of 80°. It requires about five days to hatch them. It is best to keep each day's hatch separate. The worm should be fed as soon as hatched, with tender leaves. They need feeding every few hours during the first age, and thereafter every three or four hours. The first feed early in the morning and the last late at night.

The leaves must be fed fresh and dry. They should be gathered in the evening for the next morning's use.

The feeding must be continued without ceasing until the close of the fifth age—except during their moulting periods—when they become ready to spin the cocoon. Their ages are designated by the different moulting periods they pass through, all of which takes place during a period of little over one month. When moulting takes place, during their torpor, they eat nothing as soon as their skin is shed, their activity and appetite returns. When ready to spin, which is about eight days after their fourth moult, the worms cease to eat, become restless, and, by emptying themselves, diminish in size, and become transparent.

The spinning is finished in three days. In eight or ten days after the commencement of the spinning, the cocoons are ready to gather and assort. In twelve or fifteen days from the time the worm begins to spin, the moth will issue from the cocoon, and thereby the strands of silk will be cut and spoiled. To prevent this, the chrysalis must be choked or stifled, which can be done by steaming, or exposure for several days to the rays of a hot sun, after which the cocoons are ready for sale, or can be laid away for reeling, which can be done at any convenient time. When stored away, they must be well protected from mice and other vermin, otherwise they will injure them so that they will become unfit for reeling, and thus reduce their value very materially.

There is considerable profit in raising eggs. To accomplish this the chrysalis must not be stifled, the cocoons must be laid away especially for this purpose, in a box with low sides of sufficient size, the bottom covered over with white paper upon which the moth will deposit her eggs. Each female moth lays from three to four hundred eggs, these can be folded up and laid away in a cool place for future hatching. An ounce of eggs contains about forty thousand in number, and this number of worms will produce one hundred to one hundred and twenty pounds of fresh cocoons (or one third of that weight when dry.) A quarter of an ounce of eggs is sufficient for a beginner for an experiment. They can be procured through the mail. The cost per ounce is about five dollars.

The opportunities for marketing the products of silk culture as now thrown open should encourage farmer to set out mulberry trees to some extent at least, and thereby they would prepare the way for their children, both sons and daughters, guided by their parents or aged grand-parents to lead them on in the interesting work of silk culture.

It is not necessary to carry on the production of raw silk on a large or extended plan. It is an occupation that can be tested on a very small scale. It can be started by putting out but a few trees and conducted in a limited way as an experiment, then if found interesting, and a pleasant occupation and in part profitable, more trees can be planted, more eggs hatched, and more cocoons produced, which can all be done with perhaps a little additional help, and so realize a greater money return.

The business of silk culture should be carried on if possible as a family occupation, mostly attended to by the children, thereby saving the expenditure of moneyed wages, and thus save as much as possible the expenses which would otherwise be incurred, upon the true maxim "a penny saved is a penny earned."

Through the Woman's Silk Culture Association a small pamphlet is issued entitled, "Silk and the Silk Worm" which is a complete work of instruction on silk culture. It can be obtained from said Association and will be found useful to all beginners.

Mrs. E. B. Johnson, editor of the Woman's department in the New

Orleans "Capital and Labor," is greatly interested in silk culture, and has devoted much of her time to the development of that industry in Louisiana. She is about to start a stock company for the purpose of increasing mulberry plantations and cocooneries in and near New Orleans, and has the names of some of the first gentlemen in that city as directors.

A statue of Oliver De Serres, who, in the sixteenth century, introduced the silk industry into France, has been lately unveiled at Auberras, and represents the figure beside a mulberry tree, on which worms are feeding and with a plowshare at his feet.

The Woman's Silk Culture Association have been lately had an elaborately brocaded silk dress pattern made, which was especially manufactured at Paterson, New Jersey, to be presented to Mrs. Garfield, wife of the late President of the United States. This was made from raw materials furnished the National Association by twenty-six silk culture associations in fourteen different States. Let the work keep on, in the way of silk culture, and not only dress the wives of our Presidents in silk of our own production but do not let us stop until all the American ladies wearing silk dresses can be supplied from our home productions and manufacture.

The subject being open for discussion,

Prof. **MEEHAN.** After the very interesting address of Doctor Barnes, I have some supplementary facts that I think would be of interest for the Board to hear—especially, I should like to call the attention of the Board to the failure of the silk culture referred to by the Doctor, which occurred over forty years ago. I think it is one of the most remarkable experiences in literature, that the true history of the *morus multicaulis* speculation has never been written, and that no one has ever had the real reason why the speculation failed. It is the general understanding that the reason it failed was because there was no market for the product. If the silk worm had been a success, it might then have had something to do with it; but it did not. However, the enterprise was not destroyed entirely. The real reason was not on account of the indisposition to buy silk, but because of the disease that broke out; and it was simply on account of the use of this variety of mulberry that the disease broke out among the insects, and the project failed for the time.

There was an immense place near where I lived. Thousands of cocoons were raised there, and in one season all died. The reason was because of the disease that broke out from the *morus multicaulis*. That disease was a species of malady, from one of those small species of fungi. Investigation has shown that this is what caused the epidemic. By those fungi, these *morus multicaulis* got this disease. They were raised through cuttings, and we know now what we did not know then, that the leaves of the plants were necessary for their existence. The continual taking of the leaves will weaken the strength of a plant, and it will become a prey to those small fungi, which live and prey upon that which is deprived of strength in this way. These plants were propagated from feeble cuttings, and then more propagated, which had been again weakened, until the fungi swept over them and produced the disease referred to. Doctor Barnes, in referring to it, said that the *morus multicaulis* was not hardy enough here, but it was hardy enough here until the continual plucking of these leaves, and then it could not stand. I think it is not correct that the Italians, French, and Europeans generally, propagate in that way. I think there is a continual raising from the seed there, and that that is the reason why it continues healthy in the plants. I think success here will not be from the raising of trees from cuttings, but from seed. I have no doubt that then the culture here will be a great success. It takes no longer time to raise a plant from seed than from a cutting. It grows almost as rapidly as cabbage from seed, or turnips from seed, and in two years the plants will be six or eight feet high. The growth is amazing. Thousands of seeds can be procured very cheaply from Europe, say for ten to fifteen cents, so you can raise in two years twelve to fifteen thousand plants. So it would be cheaper and better in every way to raise plants from seed than cuttings. Leaving out the health view, it would be about as economical.

The *morus alba* grows all over Asia and southern Europe. There is a variety of *morus* which has no female flowers, and could not be cultivated in that way. Some have no male and the female, and others have neither. There is one particular variety of *morus*, called the "Philippine mulberry;" and there is the *morus lævigata* of the north of India; but the mulberry of all mulberry varieties, selected from the seed, is the *morus alba*, called the white mulberry, and sometimes producing black mulberries; and so we get the white from black, and sometimes black from white seed. But there is another discovery which is, I think, a more valuable point than any recently made, and that is the silk-worm feeds almost as well on the osage orange, which is much easier to get from the seed than the mulberry. Experiments have been made, and it has been produced from the silk factory, and found equal to the finest French silk, the silk being altogether from worms fed on the osage orange. For a time, it was thought they would have a disease like the *morus multicaulis*, but to the present time they have been very healthy. There is no doubt, it seems to me, that they will continue healthy for a long time. Another kind is a silk in China from worms raised on the Indian mulberry, or *morus indica;* and another kind known as the *morus atro-puprurea.* The Chinese mulberry produces the finest kinds of silk, but they only sell the poorer and cheaper kinds of silk to the new world. They cannot raise that in Europe, but it is not local. It thrives well here; quite as well, at least, as in the old country, and that should encourage us to produce it here; and, if we do, there is no doubt we could raise finer silk than in Europe. It was produced by Doctor Stewart in 1858; and, just before the war, introduced into the South, and especially in Maryland. The silk raised from the *morus mauritiana* is found far superior to that raised from the *morus multicaulis*, and quite equal to that raised in Japan The experiments of the few years before the war show that it thrives fully as well in the United States as in Asia.

Dr. ROLAND. I desire to ask the essayist whether he knows how long these eggs can remain stored away, and then be hatched out; and then again, with what effect? I understood him to say that fresh dry leaves were furnished, and that they were fed frequently. What effect would green leaves and over-feeding have on them?

Dr. BARNES. I cannot say by experience what length of time you can keep them, although my impression is they can be kept for several years in a low temperature. They can be kept from one season to another by keeping them in an ice-house, where the temperature is low, and then bringing them out in the spring.

Dr. ROLAND. What effect would wet leaves and over-feeding have on them?

Dr. BARNES. To feed them on green leaves or wet leaves makes them sick, and they die. It is necessary to have dry leaves.

Prof. MEEHAN. Dampness causes the mildewing I have referred to, which is communicated to the leaves, and thence to the insects.

CARP AND CARP CULTURE.

By Capt. MILTON P. PEIRCE, of Philadelphia, *Fish Culturist of the Board.*

Prepared for the Board, at the request of its Executive Committee.

Fish culture being barely a quarter of a century in existence in this country, it will be proper to commence this paper with a brief summary of its rise and progress in foreign countries.

The early foreign writers always alluded to fisheries as the agriculture of waters, apparently considering seas, lakes, rivers, streams, and ponds inexhaustible preserves of food which could never be impoverished by the wants or desires of man. At a comparatively remote epoch, however, the more observing and enlightened minds discovered that fisheries were but harvestings, and that in order to secure repeated satisfactory crops, some system of sowing must be resorted to. This discovery, however, was evidently not made until mankind began to forsake their nomadic habits, and became settled in permanent locations. The first attempt at fish culture of which we have any history, were made by Chinese and ancient Romans. The methods adopted by the people of those nations were simply the collection of young fish into natural and artificial reservoirs, sometimes supplying them artificial food, but generally permitting them to prey upon each other. This method is still in vogue to some extent in all parts of the civilized world, and even among half-civilized people. Many of the Northern and Middle States have practically adopted this method, by the introduction of the much-prized black bass into their waters. This valuable variety of food and game fish subsists almost entirely upon other and generally comparatively worthless varieties of fish, and is of all others the best known variety for stocking such waters as are infested with pickerel, pike, catfish, and other predatory varieties. It is, therefore, not only feasible, but desirable, to continue under such conditions the ancient methods. This method, however, is not regarded as scientific fish culture in its modern and restricted sense.

The Chinese were undoubtedly the first to make a radical advance in the methods of fish culture. According to missionaries, who penetrated the interior of China at an early day, a multitude of fish, of many varieties, ascend the rivers of Kiang-si, and into the ditches which convey water through the rice fields. In these ditches they deposit their eggs, which are soon hatched. Both the eggs and the young fish are the source of considerable income to the riparian proprietors. One of the French Jesuits, who at an early day traversed several of the Chinese provinces, in a published account of his travels, referred to the fish-cultural industry as follows: "In the great river Yang-tse-kiang, not far from the city of Kieon-king-fou, in the province of Kiang-si, at certain times of the year, are assembled a prodigious number of boats for the purchase there of the eggs of fish. Toward the month of May, the country people bar the river in various places with mats and hurdles for a length of about nine or ten leagues, leaving only sufficient space for the passage of the boats. The eggs of the fish are stopped by these hurdles. They can distinguish them by the eye, where other persons can see nothing in the water. They draw out this water, mixed with eggs, and fill vases with it for sale, which brings at this season numbers of merchants with their boats to buy and transport it into different provinces, taking care to agitate it from time to time. They succeed one another in this operation. The water is sold in measures to all who have fish-preserves and domestic ponds. After some days there are seen in the impregnated water as it were little heaps of fish eggs, without it being yet possible to distinguish the species. It is only with time that this appears. The profit is often a hundred fold more than the outlay, as the people live in great part upon fish."

To these very simple methods of replenishing their inland waters, the Chinese are said to have joined others, which seem to have been very imperfectly understood and indicated by these travelers.

The Romans had similar customs at a very early epoch. The ancient Romans had a remarkable predilection for fish food, of which the principal luxury of their numerous banquets consisted, and the poets speak of sumptuous tables spread with this food exclusively. In the period between the taking of Carthage and the reign of Vespasian, this taste became a perfect passion, and for its gratification the senators and patricians, enriched by the spoils of Asia and Africa, often incurred the most extravagant outlays. Many of them constructed large and costly reservoirs, which they stocked with the rarest varieties of fish, and one historian states that Lucullus, like a new Xerxes, caused a mountain to be pierced in order to introduce sea water into his fish-ponds. Another refers to Hirrius, whose income from his buildings equaled $675,000 of our money, and that he employed the entire sum in the care of his fishes. The rich patricians, says the same author, were not satisfied with a single pond. Their fish preserves were divided into compartments, where they kept shut up apart from each other fishes of different kinds, and a large number of fishermen were retained solely to take care of them.

During the extended interval between the Roman Empire and the eighteenth century, history does not record any important progress in fish culture. The art, as already practiced, was however extended, and to some extent perfected during the middle ages, and fish preserves became extremely numerous in France and Italy. Kings and princes all had artificial preserves in their domains. The religious communities gave special attention to the art, and maintained extensive preserves, where enormous quantities of fish were raised. These communities exacted heavy duties upon almost all fisheries, which tended by their practice to deplete the waters of this source of food supply.

So far as we have any historical record, the first important advance made in the art of fish culture and by which, according to the modern acceptation of the term, the art was reduced to a science, was the discovery of a method of artificial fecundation of fish, by a monk named Dom Pinchon, who lived about five centuries ago. The process was described in a manuscript dated 1420, but it was not published, and remained a secret until quite recently, so that practically the discovery had no influence on the real progress of the art, and is principally interesting in a historical point of view. While the discovery of Dom Pinchon remained locked up in a manuscript, other active minds were seeking new methods which might serve to increase the production of food fishes. A Swedish counselor of Linkoeping, named Charles Frederic Lund, observed that many of the most esteemed varieties of fish of that country in casting their spawn attached the same to willows, twigs of pine, &c., which chanced to hang in the water inhabited by the fish. He caused large wooden boxes to be made without covers, but pierced with numerous little holes and furnished with rollers to admit of their easy descent into the water. In these boxes he placed twigs of pine and a few male and female fishes taken in the spawning season. After having left them there for a few days, until the female had deposited her eggs, (which were immediately fertilized by the male,) he removed the fishes with a net and carefully arranged the boughs so that they would not press together too hard. In due time the eggs brought forth multitudes of small fishes. This simple process included all the conditions necessary to success, and in this manner Lund succeeded in transporting from one lake to another, boughs covered with spawn, keeping them of course under water during the transit. In this manner he transferred millions of young fishes from one lake to others.

About the year 1740, one, J. L. Jacobi, a lieutenant of militia in Westphalia, in watching trout during their spawning season, discovered that the female forced herself through the surface of gravel beds in clear water and thus cast her eggs, upon which the male trout immediately following cast his milt, stirring the eggs with his tail, and thus fertilizing them. Jacobi immediately caught both female and male trout, and over a vase, half filled with water, gently pressed the abdomen of first the female and then the male, letting fall into the water the mature product of both sexes, then stirring the water with his hand, rendered the mixture complete, and thus accomplished artificial fecundation, precisely as Dom Pinchon had done centuries before.

Jacobi did not "hide his light under a bushel," but sent manuscript notes to several prominent officials and literary men, describing his process. These manuscripts, or versions of same translated into different languages, were published in Germany, France, England, and probably Austria, and other European States, but the publications were mainly buried in the great libraries and had but a limited circulation. It seems, however, that an occasional savant, attracted more by the novelty than the utility of the discovery, from time to time tried successful experiments. Descriptions of these experiments have been published and translations are in the possession of the writer of this essay. Although very interesting, they are too voluminous to reproduce here.

About the years 1842–3, a French fisherman of La Bresse, named Joseph Rémy, made the same discovery, which had been previously made by Dom Pinchon and Jacobi, and of which Rémy was entirely ignorant. Rémy associated with him another fisherman named Antoine Géhin, and these two unlettered fishermen made a careful study of the habits of trout, and soon succeeded in artificially fecundating and hatching thousands of eggs. They did not stop here, but systematized their work and commenced stocking ponds and water-courses in their region. The result of their experiments and labors becoming known to the Society of Emulation of the Vosges, that society investigated the matter and granted a premium to the two fishermen. Subsequently the French government recognized the acquirements of these fishermen by employing them to stock numerous waters of the country. In due time official documents, containing reference to these matters, began to be received in the libraries of the United States, and the subject-matter came to the notice of medical societies and scientific men.

About the year 1853, Theodatus Garlick, M. D., at the time connected with the Cleveland, Ohio, Medical College, learned of these European developments, and together with his friend and associate, H. A. Ackley, M. D., commenced a series of experiments in the artificial hatching of trout, which resulted in the most gratifying success. The writer, at the time a resident of Cleveland, had the pleasure of studying the process and of examining the first fishes artificially hatched in this country. Two or three years later Drs. Garlick and Ackley published the first work on fish-culture ever issued in this country, the writer having the privilege of reading a portion of the "proofs." It will be seen by this that scientific fish-culture in this country dates back only about a quarter of a century. A very interesting chapter could be written respecting the experiments, labors, failures, successes, and general trials of several gentlemen who have attained more or less prominence since that time, in their endeavors to build up a new industry.

Other interesting and instructive chapters could be collated from facts in connection with State and National legislation upon the subject. Most of the States and some of the Territories have fish commissions, and the United States Fish Commission, created by act of Congress, in 1871, is, without doubt, at the present time, the most efficient organization of the kind in any country. Many of the States also have very efficient fish commissions, but in too many instances they are not provided with adequate legislative appropriations. Some of the Legislatures have been reasonably liberal and their respective commissions have been enabled to take effective measures for re-stocking the sadly depleted waters of their regions. Some of the commissions have been enabled to construct substantial breeding establishments and to prosecute the business with systematic intelligence.

Through the courtesy of the Pennsylvania Fish Commission I am enabled to present exterior and interior views of their breeding establishments; the eastern, pages 192 and 193, located near Marietta, in Lancaster county, and the western, pages 194 and 195, located near Corry, in Erie county.

The principal subject of this paper, however, refers to a food fish that requires no such elaborate breeding establishments as have heretofore been necessary for the extensive production of our more valuable varieties of food fishes. With this new acquisition, it is practicable for any farmer or ruralist, having even a limited supply of water, to furnish his own table with delicious fish, and in most cases, to supply large quantities for market.

The Food Carp.

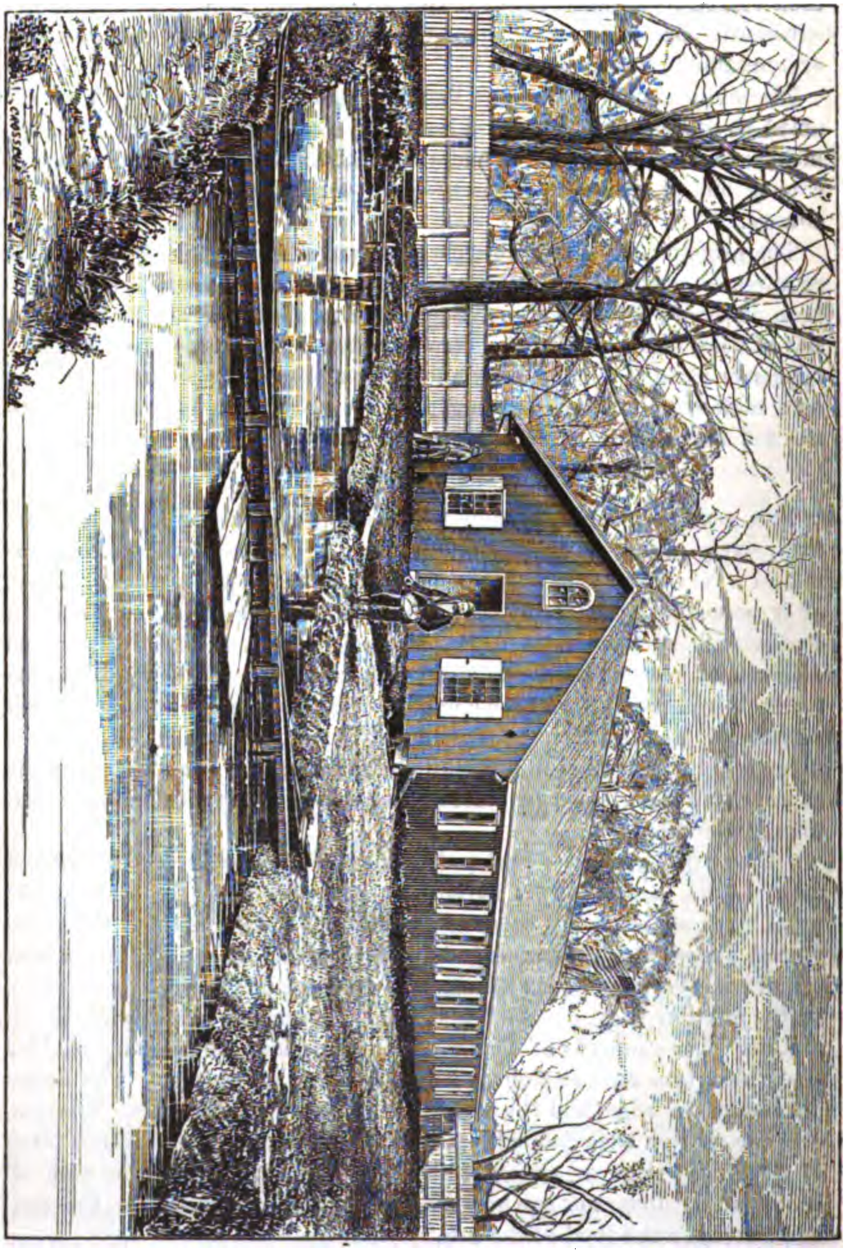
This remarkable and valuable food fish, which has for centuries been extensively raised in various countries of Europe and Asia, and has furnished a very large percentage of the food supply of those countries, has, after persistent attempts of the United States Commission of Fish and Fisheries, been introduced into this country, and its culture has been commenced in most of the States. Wherever the simple requirements for its introduction have been complied with, the results have been most satisfactory and gratifying. As some of the more critical readers of this paper will be interested in a brief description of this fish I will copy the same from a description by Doctor Hessel, one of the most reliable German authorities:

" The carp, *Cyprinus carpio*, of the family *Cyprinidæ*, has a toothless mouth, thick lips, and four barbels on the upper jaw. In place of the usual teeth of the mouth there are a number of stout teeth on the pharyngeal bones, which are arranged in three rows. It has one single dorsal, which is no longer than the anal. Both these fins have at their origin, on the anterior edge, a strong ray, which is serrated in a downward direction. The caudal is of semi-circular shape, and the natatory bladder is divided into two sections, with connecting air-passage. The scales have an entire edge, and the body is compressed on the sides. The general color of the back and sides is a dark olive-brown, the abdomen often of a whitish-yellow or orange tint. The coloring depends, as with all fishes, partly upon the age and season, partly upon the water, the soil, and also upon the food of the fish."

The carp was in all probability originally introduced into Europe from

Central Asia many centuries ago. It is alleged to have been imported into England in the year 1504. In Austria, which possess the most extensive carp establishments in Europe, its culture can be traced as far

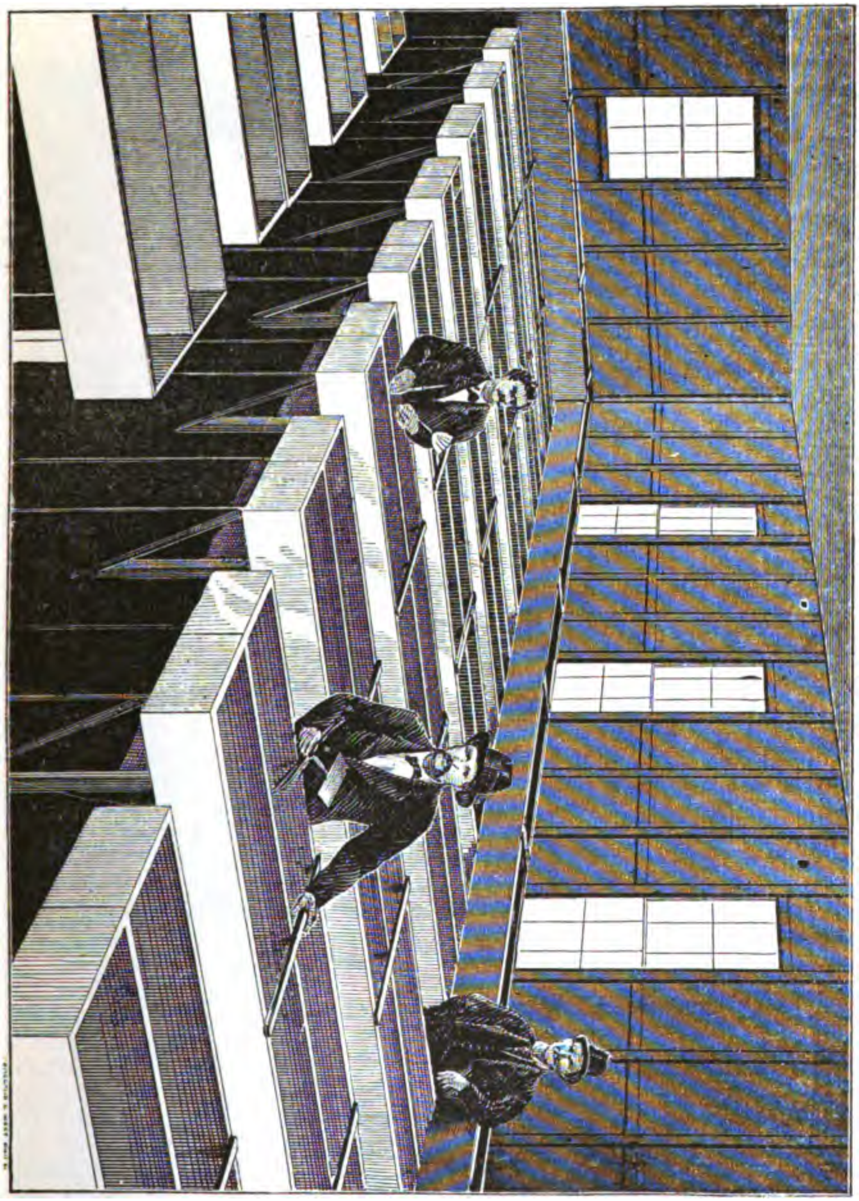
FIG. 1.



EASTERN (PA.) HATCHING HOUSE. See page 191.

back as the year 1227. The Austrian princes of Schwarzenberg are probably the most extensive carp culturists in the world. Their artificial ponds, collectively, cover an area of no less than twenty thousand acres.

FIG. 2.

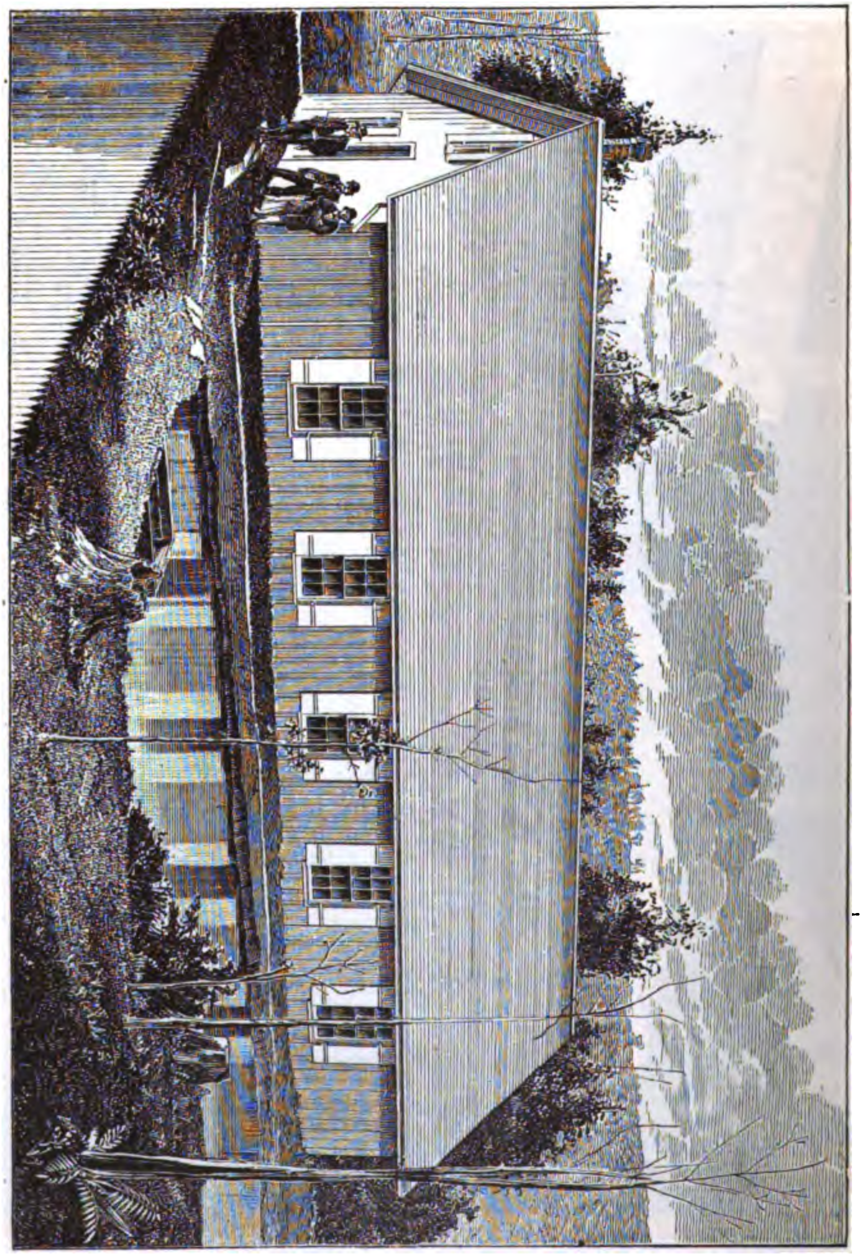


INTERIOR VIEW OF FIG. 1. See page 191.

Many other extensive carp establishments are located in various parts of Europe, notably in Austria, Germany, and France.

There are many varieties of carp, the most of which are comparatively

FIG. 3.

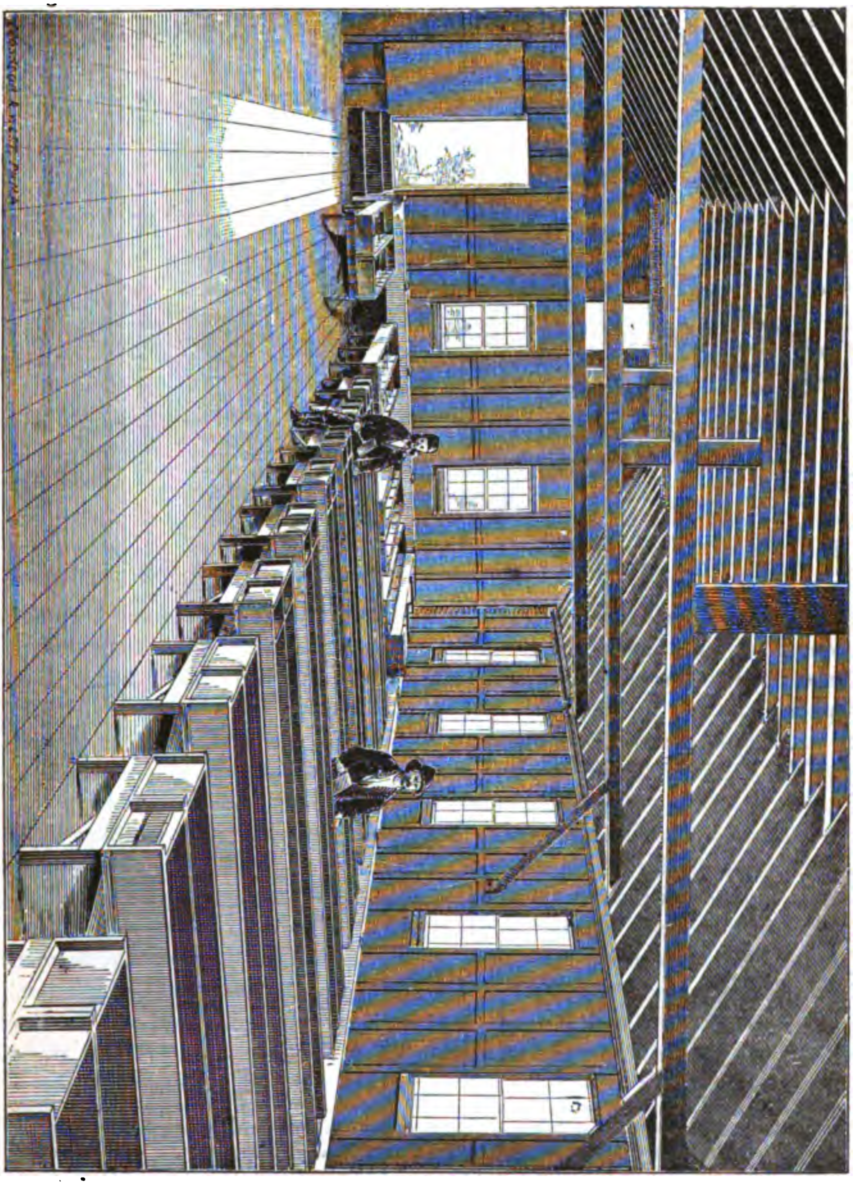


WESTERN (PA.) HATCHING HOUSE. See page 191.

worthless as a food fish. The common gold-fish is a specimen. The common sucker and numerous other specimens of brook fish are also of the carp family. There are also several varieties of the food carp. Dr. Hessel refers to them as follows:

"It will be easily understood that after such an exclusive culture in

FIG. 4.

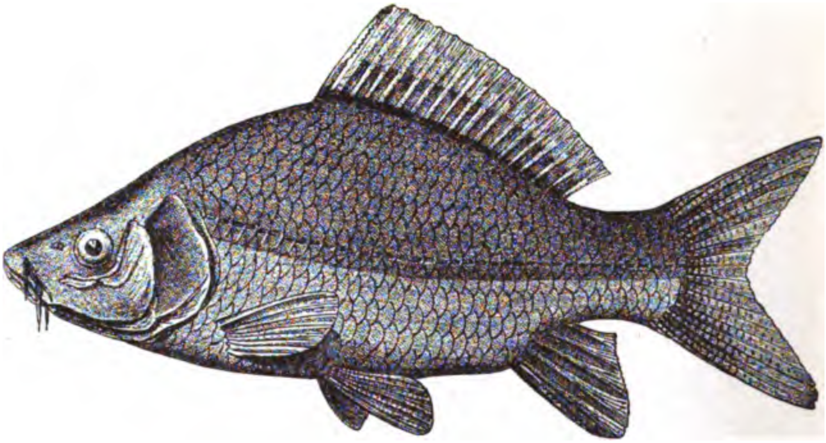


INTERIOR VIEW OF FIG. 3. See page 191.

ponds, continued through centuries, as also an existence in open water, where the *Cyprinidæ* were left more to themselves, a number of varieties or rather genuine species *Cyprinus carpio*, showing striking differences from the races were developed; these races, though derived directly from the original type, just as with our domestic animals. They are divided into three chief groups:

1. *Cyprinus carpio communis*, the scale carp; with regular, concentrically-arranged scales, being, in fact, the original species improved. See page 196.

FIG. 5.



THE SCALE CARP, *(Cyprinus carpio.)* See page 196.

2. *Cyprinus carpio specularis*, the mirror carp; thus named on account of the extraordinarily large scales, which run along the sides of the body in three or four rows, the rest of the body being bare. See page 197.

3. *Cyprinus carpio coriaceus*, *sive nudus*, the leather carp; which has on the back either only a few scales or none at all, and possessing a thick, soft skin, which feels velvety to the touch. See page 198.

The two last named are distinguished from the original form by a somewhat shorter and stouter, but more fleshy body.* It is rather difficult to decide which of these three species is the most suitable for culture. There are some districts where only scale carp are bred and mirror carp are not valued, as there is no demand for any but the former in the market, as, for instance, in Bohemia, in the domain of Wittingau. Again, in other districts, as in parts of Bavaria and Saxony, &c., for the same reason, mirror carp or leather carp only are bred. There is, in fact, no sufficient reason for making any distinction among these three varieties, for if they are genuine types of their respective species they are indeed excellent and desirable fish."

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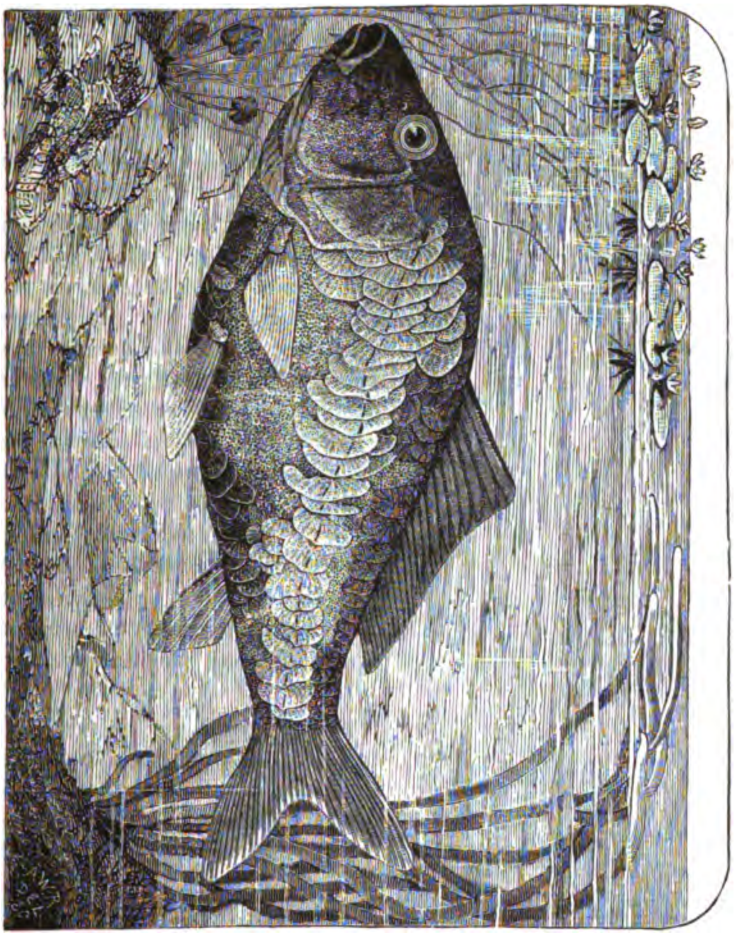
*I have in my own ponds each of the so-called different varieties, but cannot detect any material difference in shape. Breed either separate and their progeny will, to some extent, develop into each of the three types, and sometimes other marked variations. See concluding chapter, headed "Miscellaneous Observations."

Each of the three varieties named have been imported by the United States Fish Commission, and have been bred separately now for four or five years. Prof. Baird, (the United States Commissioner,) assures me that both the scale and mirror varieties are unmistakably developing into the leather carp, which upon the whole is the most esteemed variety.

FIG. 6.

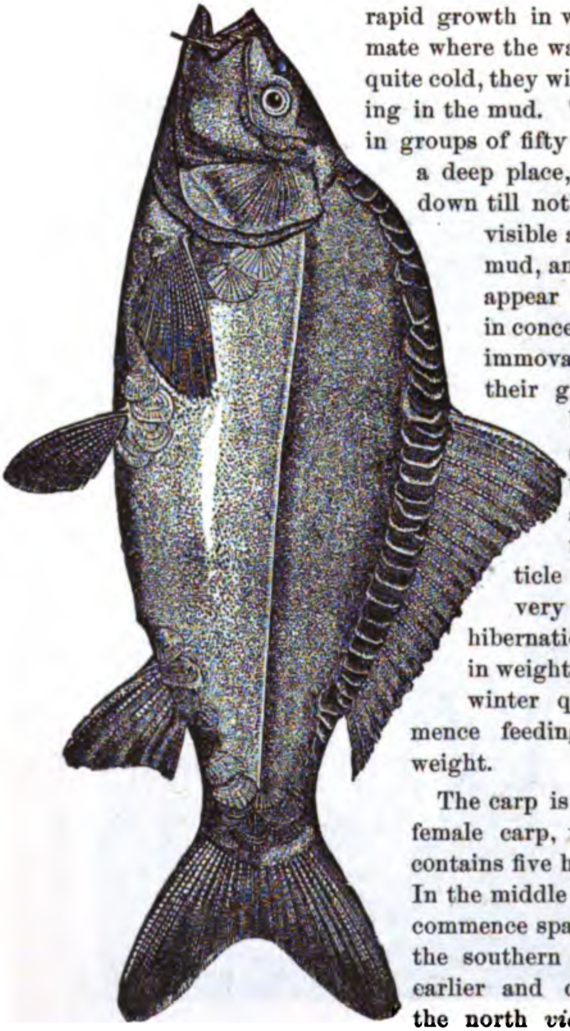


THE MIRROR CARP. See page 196.

The carp is partial to stagnant waters with a loamy or muddy bottom, rich in aquatic plants. They will live and thrive in water where most other fishes could not possibly exist, such as small pools in bog-meadows, or in localities affording no regular outlet. Of course, it must not be expected that such waters will produce as good flavored fish as pure waters.

The carp subsists upon vegetable food, and to some extent upon worms, larvæ of aquatic insects, &c., which it turns up from the mud with its head, or gathers from aquatic plants. It will not refuse the offal of the kitchen, slaughter-houses, breweries, &c. It attains a much more rapid growth in warm waters. In a climate where the water freezes or becomes quite cold, they will hibernate by burrowing in the mud. This they generally do in groups of fifty or more. They select a deep place, and force their heads down till nothing but their tails are visible above the surface of the mud, and sometimes they disappear entirely. They group in concentric circles and remain immovable, scarcely raising their gills for the process of breathing. In this position they continue till the water becomes warm again, during which time they do not take a particle of food, and, what is very remarkable, during this hibernation they do not diminish in weight, but upon leaving their winter quarters at once commence feeding and increasing in weight.

FIG. 7.



THE LEATHER CARP. See page 196.

The carp is a prolific breeder. A female carp, weighing five pounds, contains five hundred thousand eggs. In the middle States it will probably commence spawning in May, while in the southern States it will spawn earlier and continue later, and at the north *vice versa.* Some days before commencing to spawn it shows an increased vivacity, rising frequently to the surface of the water, and swimming rapidly around near the surface, apparently searching for favorable places to cast its spawn. Its movements are much more rapid on warm, sunny mornings than at other times. On these occasions the female is accompanied generally by two or more males, frequently five or six. They follow closely, sometimes closing in on either side of the female. They come close to the waters edge, particularly in shoal places, and seem to lose all timidity to an extent that they might be easily captured. During their movements they twist the posterior portions of their bodies energetically, lashing the water vigorously with short quick movements of the fins and tail. This is the moment when the female has cast her spawn, upon which the males cast their milt, and mix with the eggs by the lashing process described. In this manner most of the eggs are impregnated. This process is frequently repeated, the female dropping four to five hundred eggs each time. These operations continue for weeks, and until the female has cast all her eggs. The spawning continues through the summer, according to the various ages of the spawners, the oldest spawning early and the youngest late. The eggs are adhesive, and readily adhere to aquatic plants, brush, or any fibrous material. Most of the impregnated eggs thus suspended in the water will hatch, while those which drop into the mud are, it is believed, thereby destroyed. The eggs hatch in from five to twenty days, depending upon the temperature of the water. If in shallow water and the weather remains warm and pleasant, they will hatch within less than ten days, but if in deep water, or in cold stormy weather, the development may be retarded, and perhaps three weeks required to complete the hatching process. The yolk of the egg adheres to and is absorbed by the young fish within from three to five days, after which it begins to seek for food. If the pond be productive of suitable food, the young fish will grow rapidly.

When all the conditions are favorable, the growth of the carp is almost incredible. The age of the oldest carp which I have ever seen, was but three and one half years, and they weighed fourteen pounds each. They were of the "leather" variety, and had never received a particle of artificial food, but had an ample pond, rich in natural food. The growth ot carp, of course, depends upon certain conditions. The best results are attained in small ponds of warm water, which of course are more rich in natural food supply, than are large, deep, cold bodies of water.

Overstocking of ponds would be attended with the same results as the overstocking of pastures with cattle. Large, deep bodies of cold water, with stony or gravely bottoms, are not favorable to the successful growth of carp. Their growth will vary from year to year in the same waters, according as the season is a cold or warm one, very much as farm crops will vary according to the season. The season has undoubtedly much to do with the food supply of waters. It has been practically demonstrated that the waters of this country are far richer in fish food than those of Europe.

To what age will carp live? How large will they grow? These are questions frequently asked. Those who may choose to learn by experiment, are advised to commence the propagation of century plants, expecting to see them bloom. There are carp in some of the preserves in Austria, known to be about one hundred and fifty years old. There is an authentic record of a carp being taken, which weighed ninety pounds, and numerous records of their weighing from seventy-five all the way down to thirty-five or forty pounds, the latter weight not being unusual. Carp known to be but fifteen years old have been taken, weighing from forty to fifty pounds each, and even more in some few cases. A fifty pound carp is said to be about four feet in length, by three feet in circumference.

I have not been able to obtain any data, showing very accurately the number of pounds of carp which can be raised in a given area of water, but by a careful examination of all obtainable data, I find that their average growth in European ponds, in the latitude of New England, is more than two pounds each annually. We may reasonably expect better results in this country, particularly in more southernly latitudes. In Europe, hundreds of thousands of acres of their most fertile lands are devoted to carp culture, which is pretty positive proof that these areas are turned to the most profitable account. The propagation of carp in Europe is becoming universal, and is prosecuted on every imaginable scale, from immense artificial lakes, down to tanks holding but a few cubic feet. It is said that in China, carp are reared to a great extent in ordinary wash-tubs, and fed with vegetable refuse.

In Germany, the best results are attained by an alternation from carp culture to that of cereals, &c., on the same ground, *i. e.* after a few years of carp culture, the ponds are drawn off, and the sites farmed, for say two years, when they are again flooded, and stocked with carp, and so on alternately.

Practical Carp Culture.

Believing that the day is not far distant, when carp culture will be as common in this country as poultry culture now is, and believing also that it will be a more profitable industry, I will proceed to give the best known methods for conducting the business. Before taking up details, however, it may be well to remark, that carp culture, like any other business, rerequires a perfect system. A hole dug in the ground like a brick-yard pond, can be utilized for raising carp, providing it be always supplied with water, but it would not be a very desirable method, though exceedingly simple.

I will first notice the methods in vogue in Europe for carp culture, in what they term natural ponds, *i. e.* ponds constructed by the simple damming of streams. In this connection, I will quote from Dr. Hessel, one of the best German authorities upon the subject.

In establishing carp in natural ponds, it is first necessary to ascertain the following points:

1. Is there sufficient water for all purposes all the year round?

2. Is the ground, soil, aquatic plants, and water, favorable for culture?

3. It is important to examine the soil minutely, in order to ascertain its vegetable and mineral qualities.

If points one and two have been satisfactorily settled, the ground must be examined as to whether it will allow the collected water to penetrate, and whether the ground is sandy or loamy. Above all, measure the depth of the stratum, and be assured that it is sufficiently impermeable to withstand the pressure of the water and to hinder its oozing through, and so prevent the drying up of the pond.

A rocky, gravelly ground is not appropriate for carp culture. Sandy ground, with a considerable mixture of loam, clay, and humus, is of small use.* I speak here of large ponds of considerable extent. Small ponds, with a sandy bottom, may be improved by supplying them with loam. Loam is a mixture of a small per cent. of sand and a larger quantity of clay. If such ground contains some marl, or better, some elements of humus, it is of the greatest advantage.

Too much humus or dissolved peat is injurious. Water which runs through bog meadows or oak woods is not of much use, because it contains too much humic acid and tannin, which impart a mouldy flavor to the fish. The most favorable water is that which comes from rivers and brooks.

Rain water, particularly during the winter, when frozen over takes a mouldy taste, which is communicated to the fish, as does the water from bogs also.

Spring water, direct from the ground, ought to be conducted for at least a few hundred yards through wide, shallow ditches, in order to obtain more nourishing components from air as well as earth, and above all to be warmed by the action of the sun.

Ponds must not be too deep, as the water will be too cold, and will harbor fewer insects, larvæ, and worms, which form part of the carp's food. A depth of three feet is sufficient for the middle of the pond. Toward the outlet-sluice it may be from six to eight feet. In the depths of this the fish seek their resting place for winter, as also in summer, when the water becomes too warm. The outer part of the pond should not be deeper than a few inches.

Toward the center of the pond a cavity is dug, two feet deeper than the rest of the pond. This also serves the fishes as a resting place in summer and winter. This cavity is called a "kettle." From the entrance of the pond to the other end, where the collector and the outer sluice are situated, two or three ditches, two feet in depth and four feet in length must be made. These ditches cut the deeper "kettles" transversely as far as the collector. These ditches are intended to carry all the fish into the collector when the pond is being drained. The collector is nothing but a place from twenty to forty feet in length and breadth, near the outer sluice, and is one foot deeper than the rest of the bottom of the pond. This collector must be cleaned out every year, or the fish will become too much soiled by the mud. The inflow of water into a pond should never be direct, as, for instance, a brook falling into it, as this often causes the water to suddenly rise, carrying into the pond injurious fishes. The inlet sluices from the stream must of course be of a strong and practical construction, and they ought to be provided with gratings, to prevent other fish from intruding. It will also be found very useful to construct a hatching-place on some flat and sunny spot near the bank—that is, a so-called cut in the land, measuring forty to one hundred feet in length, and from thirty to fifty feet in breadth, and having a depth varying from eighteen inches to five inches. This cut should be planted with aquatic plants, and ought to be the only place where the carp can ascend from deep water in order to deposit their eggs conveniently on the plants and engage in the spawning process. As soon as this has taken place, the entrance to the cut is closed with a net. See Fig. 8.

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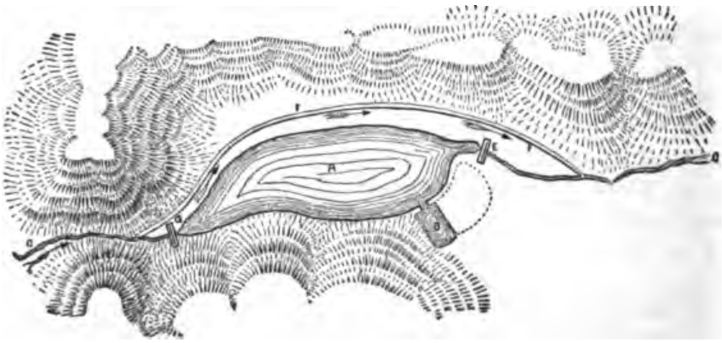
*This idea will not hold good in this country. Such sites, if other conditions are equal, are excellent for carp ponds, if prepared in accordance with my plans, hereafter described.

The carp also has the disposition to swim toward the inflowing water, by which means it is drawn away from its proper feeding-places. The water should be conducted into the pond sideways from the stream, and it should be a small brook only. It may be turned off entirely and carried alongside the pond, from which point the latter can be easily supplied with water.

It is an indispensable condition for the culture in ponds, according to established rules, that they be so constructed as to allow of being thoroughly drained, so that the fishes may be taken out without any difficulty.

For the draining of the pond at the "fishing-out" season, it should have an outlet at the lower end, so made that it can be closed tightly or opened again readily if needed, and must be provided with two or three

FIG. 8.

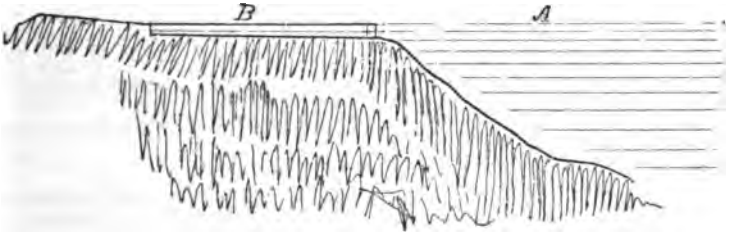


PLAN OF NATURAL POND. See page 203.

fold gratings, to prevent the escape of the fishes upon the opening of the sluice. At the same time there should be an outlet channel, several feet in breadth, at the side of the pond to allow the water to run off. This must also be secured by grating, but should be kept open always, so that in case of continued rainy weather or sudden and violent showers of rain or thunderstorms, no overflowing of the banks or dams may be possible through the expected rising of the water in the pond.

Explanation of Fig. 8.—*A* is the pond, *B* is the cut or breeding pond; the dotted line contains the water, having a depth of only five inches; *B* is the water of one and a half feet in depth; *F F* is the outer ditch to prevent an overflow of the pond; *G* is the inlet sluice; and *E* is the outlet sluice.

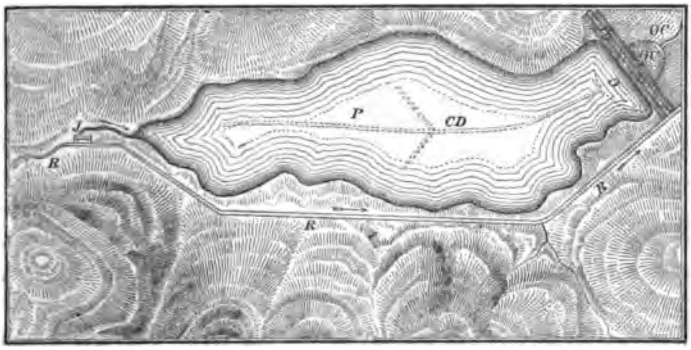
FIG. 9.



B A CROSS-SECTION OF POND THROUGH BREEDING-PLACE IN FIG. 8. See page 203.

Fig. 10 is a natural pond. It is formed by a dam, *D*, crossing a valley, and thus collecting the water of a run flowing there. The pond gradually deepens from *CD* to *C*, the collector. In the dam, *D*, there is an outlet leading to another deepening, the so-called outlet collector, *OC*. The purpose of this collector is to retain fish that may have passed through the outlet when opened. It is provided with a screen or netting.

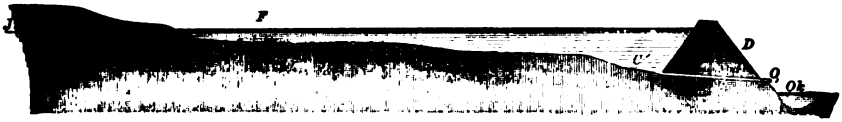
FIG. 10.



PLAN OF NATURAL POND, SHOWING COLLECTOR DITCHES, COLLECTORS, &C. See page 203.

Upon the bottom of the pond, *P*, *CD* to *C*, is the collector ditch, which conducts the fish to *C*, when the water is let out, and thus prevents them being caught in the mud. *R* is the run of water which, to prevent overflow, has to be conducted around the pond in a separate ditch, leaving an inlet at *J*, protected with screens.

FIG. 11.

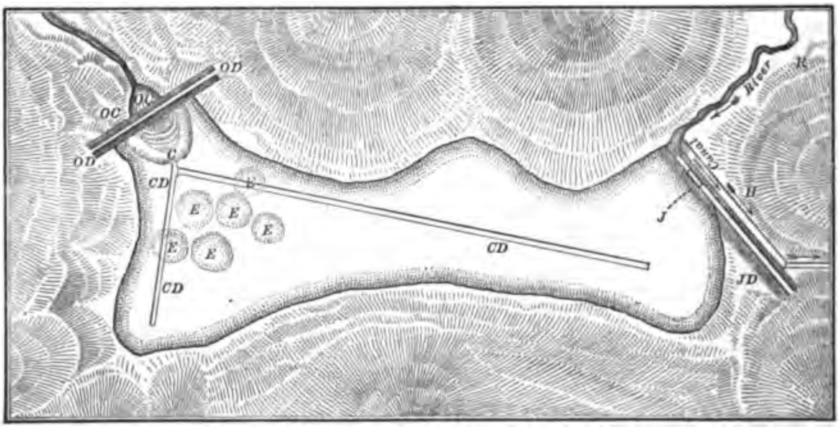


CROSS-SECTION OF CARP POND, FIG. 10. See page 204.

F, surface of the pond; *C*, collector; *D*, dam; *O*, outlet; *Ok*, outlet collector; *J*, inlet; *R*, stream.

The foregoing illustrated descriptions represent some of the earlier European methods. The next illustration is of a more modern and improved method, much in use in various parts of Europe.

FIG. 12.



PLAN OF ARTIFICIAL CARP POND. See page 204.

R, stream supplying artificial pond between undulating hills; *J*, inlet; *JD*, inlet dam; *CD*, collecting ditches; *C*, collector; *OD*, outlet dam; *O*, outlet; *OC*, outlet collector; *E*, cavities, "kettles," in which the carp collect for the winter; *H*, canal to let off surplus water in case of freshets.

To conduct carp culture according to the latest improved methods, several ponds are required, three at least.

1. The hatching pond.
2. The nursery pond.
3. The stock pond.

The hatching pond, as its name implies, is for the reception of adult male and female fish during the spawning season. Here the females drop their eggs upon aquatic plants, where they are immediately impregnated by the male. As soon as the spawning season is over, the adult fish should be removed to the stock pond, that they may not consume the natural food in the hatching pond, which is required by the young fry. The young should remain in the hatching pond one season, and then be transferred to the nursery pond. The third season, when the necessary breeders have been selected, and removed from the stock pond, the fish from No. 2 pond can be transferred to No. 3, and the young fry from the hatching pond (No. 1) into No. 2. There will also probably be some young fry found in the stock pond, and they should be placed in No. 2 pond with those of same age. Parties intending to engage extensively in the business, should have such additional stock ponds as may be practicable, and keep each year's stock separate.

The hatching pond should be the smallest, the nursery pond considerably larger, and the stock pond much the largest, and so increase in size, according to their number if possible. See *Fig. 13.*

In Europe, from four thousand to five thousand young carp is considered a sufficient stock for an acre of water. It has already been demonstrated that the waters of this country are much richer in carp food than the European waters, but experience only will determine to what extent our waters may be stocked. It will depend of course, upon the amount of aquatic plant growth mainly. If that is abundant, probably one thousand fish to the acre would be ample stock.

If there are too many young fish in the spawing-pond, they grow very slowly, as the pond cannot produce the necessary quantity of food. Such fish are scarcely two inches long when they are one year old; only the head grows a little, whilst the rest of the body remains small. As soon as young fish feel the want of food for any length of time, the gristle and bone of the skeleton harden, thus bringing its development to a close, not allowing nature fair play, and the fish remains a cripple for the rest of its life, even if it is placed in ponds affording unlimited supply of food. It is, therefore, better either to place a less number of young fish in the ponds or to make the ponds larger; it will be found to pay. The young fish will grow rapidly, their development will be healthy, and even during the first year they will reach the length of five to ten inches in our Northern States, and double that growth in the extreme South. If there are too many young fish for the water-area, it is better to place them in some lake, brook, or river. On no account should they be kept in the pond. Beginners in carp-culture usually consider it quite a sacrifice to let so many young fish loose in open waters; they keep them, and later they will bitterly regret their imprudence, by having weak or not fully developed fish.

Great caution is necessary in the selection of the site for a pond or the natural pond which is to be converted into a carp-pond.

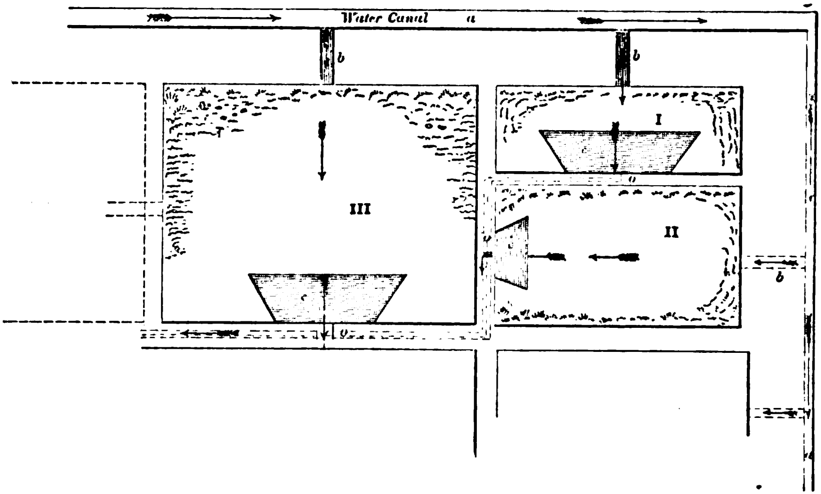
Overflows not only injure the ponds and fishes, but may result in a still worse disaster, that of carrying away the fishes into strange waters and destroying the ponds.

The fundamental rule in carp-culture is that the water be of the same depth in summer and winter. If the supply of water is too plentiful, great quantities of mud are carried into the pond, embedding the grass which grows in it and on its banks; this, in consequence, will rot and poison the water. The carp immediately desert such water on account of its offensive odor, and retire from their proper feeding places to depths deficient in the production of food.

The mud, which is being constantly reproduced, consists of decomposed plants. From these, different gaseous compounds develop themselves in midsummer, and the fishes become sickly in consequence. In this case, especially if they rise to the surface seeking for air, more water must be supplied through the inlet-sluice, when they will recover by degrees. A casualty of this description may occur in very large ponds, though no overflow may have taken place.

Pernicious gases develop themselves from the mud even in winter, but they rarely have any bad effects, being injurious only if the water is covered by ice, when the fishes may die of suffocation. For this reason, large apertures should be cut into the ice for the supply of fresh air in ponds thus affected.

FIG. 13.



PLAN FOR ARTIFICIAL CARP PONDS. See pages 205 and 206.

I, breeding pond for spawning fishes and spawn; *II*, pond for small fry; *III*, pond for large fish; *a*, supply of water; *b*, inlet; *c*, collector; *o*, outlet.

In Fig. 13, is presented a plan of ideal carp-ponds, purely artificial, which conform to some American methods of fish culture.

The foregoing is Doctor Hessel's plan for the general construction of carp pounds. To carry the plan into execution, a level or slightly sloping situation is required. By this method all danger from freshets can be avoided, providing the location itself is never over-flowed, or even if the pond embankments are above high water and are kept well sodded, so as to prevent washing away by slight currents. Locations liable to overflow should be avoided, if possible.

Peirce's American Method.

The matter comprising the foregoing pages is mainly compiled from foreign sources—Austrian, Italian, German, and French—the larger portion being from the German. Since 1873 I have collected every available translation upon the subject. In some cases I find much of the matter to be repetitions of previous writers, and frequently it is impossible to determine with whom it originated.* I have had considerable correspondence with German fish culturists upon the subject. Although the mass of matter from which the foregoing compilation has been condensed would equal from four to five hundred of these pages, yet I believe that all which is of practical value is herewith collated. For the purpose of perfect connection and harmony, I have found it necessary to introduce considerable original matter into the foregoing pages.

From their first introduction into this country I have given the food carp every possible attention; have had charge of the Government distributions in eastern Pennsylvania and southern New Jersey; have been carefully breeding them myself and have planned and superintended the construction of a large number of carp ponds for prominent parties in Pennsylvania, New Jersey, and Delaware. Based upon the most careful and patient observation and experience stated, I have devised certain methods of culture which I think are in advance of any hitherto practiced. Some of my devices are patentable, and I have been repeatedly advised to patent them. I shall not do so, but in the following pages cheerfully hand them over to the public for whatever they may be worth. I will here refer to my long experience as a general fish culturist for the purpose of saying that I do not consider such experience of much practical value to the carp culturist for the reason that the food carp is almost wholly unlike any other variety of fish in this country, excepting in its breeding habits, which, of course, are similar to all members of the family *Cyprinidæ* perhaps the most extensive of any in American inland waters, and embracing a large variety of common brook and pond fishes such as the roach, dace, and chub. The Chinese golden carp, of which the aquarium gold fish is a specimen, is also of the same family, and its breeding

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[* This reminds me that I have, during the past three years, written a large number of articles upon this subject for many of the leading journals of this country. I very often find these articles in other journals mangled almost beyond recognition, the sense in a great measure destroyed, sometimes completely reversed. In two or three instances, editors of prominent journals have solicited these articles from me and then deliberately taken such liberties as above described. I mention this matter here to say that I am unwilling to father all which appears in public journals over my unattested signature.—Peirce.]

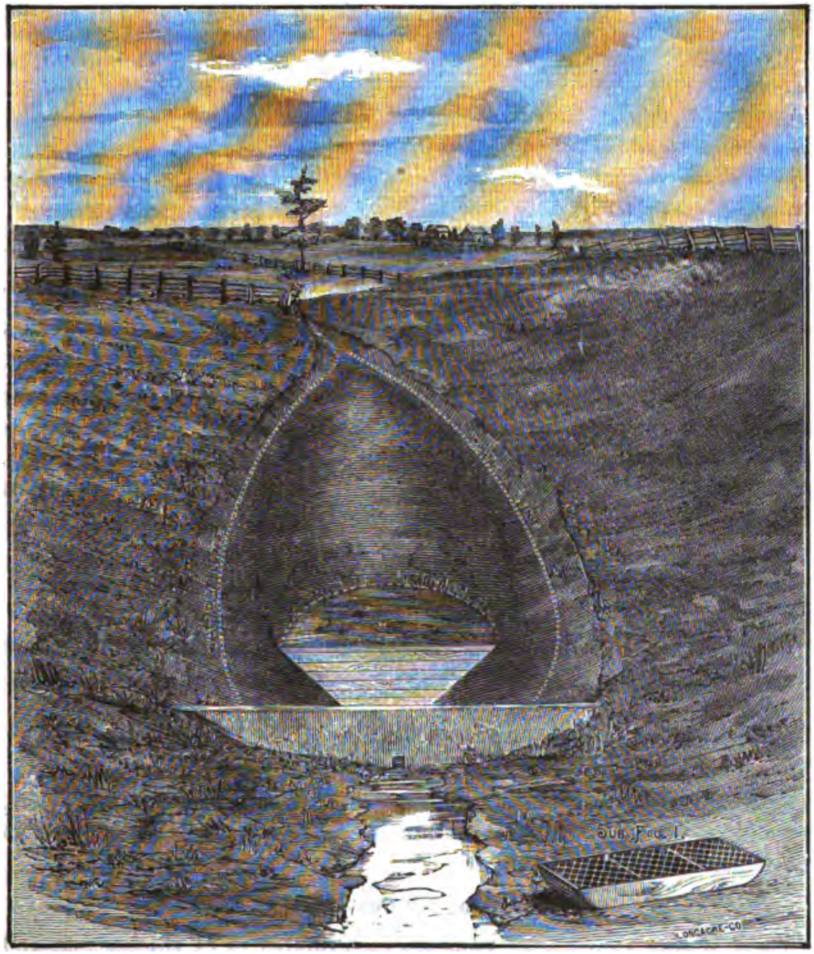
habits quite similar. I mention these facts here to show that the requisites in carp culture are unlike any other variety of food fish culture. In this connection I can, however, refer with more satisfaction to my hydraulic engineering experience of over thirty years, trusting that the results as applied to the construction of carp ponds, and illustrated in the following pages, may be of practical advantage to those engaging in this interesting and important industry.

System Indispensable.

No person should for one moment think of engaging in carp culture, except with the same degree of system which is required to render any other industry a success. Nothing must be done in a haphazard manner, nothing left to chance. Most of those commencing the business, or desiring to, seem to think that if they have a permanent supply of water, no matter in what shape, whether a lake, mill-pond, ice-pond, brick-yard hole, open stream, ditch, or even a permanent mud-hole, they have only to introduce a few carp, when, after a brief time, they expect to gather a perpetual harvest. Most of those who have already engaged in the business will find their locations briefly described in the foregoing enumeration. Their efforts will prove unsatisfactory in most cases. Such of the waters named as will support fish are almost certain to contain different varieties of the family *Cyprinidæ*, with which the food carp is sure to hybridize, and such offspring is utterly worthless. Quite a number of parties in different States have during the past fifty years or more been engaged in raising the common gold-fish in ice-ponds, or other ponds very simply prepared for the purpose. As the business is of little account, many persons having these ponds have introduced therein the food carp, (the government supplying them free.) The result is that some of these parties are selling the progeny thus bred at enormous prices, while at the same time they are of no value whatever. Some one has sent me a circular issued by one of these parties, with a nicely engraved specimen of what he terms a German carp. It is unmistakably a hybrid of the food carp and common gold-fish. It will be charitable to suppose that the publisher of that circular is ignorant in regard to the absolute worthlessness of the fish which he is offering for sale at various prices, up to five dollars each. Concerning these haphazard methods of culture, one conclusion is inevitable. Within a few years, there will be a " hue and cry " in widely extended localities that the carp is a fraud, and carp culture a humbug. On the other hand, those who commence and conduct the business according to the most-approved methods, maintaining the same degree of system required for any successful business, will find the industry very interesting, simple, requiring little attention, and, withal, exceedingly profitable.

The illustrations upon the following pages are from plans which have been carried out under my personal supervision, and are, therefore, practical instead of ideal. In devising these plans and methods, I have kept constantly in view the fact that the food carp is naturally a vegetable feeder, though also feeding readily upon microscopic and larger animalculæ, which breed or live upon various aquatic plants. Some parties who assume to give information concerning carp culture write knowingly as to the feeding of carp, the kinds of food required, &c. It is true that hungry carp will eat any vegetable matter that a hungry pig would consume, while the latter would nearly or quite starve if it only had access to the natural food of the carp. I boldly maintain that in order to succeed in carp culture, these fish should not be fed at all, except when nearly ready for the table, and then in the manner which I will describe further on. Their ponds should be inexhaustible pastures, where they can feed at will. If artificially fed, they will cease foraging, and hang

FIG. 14.

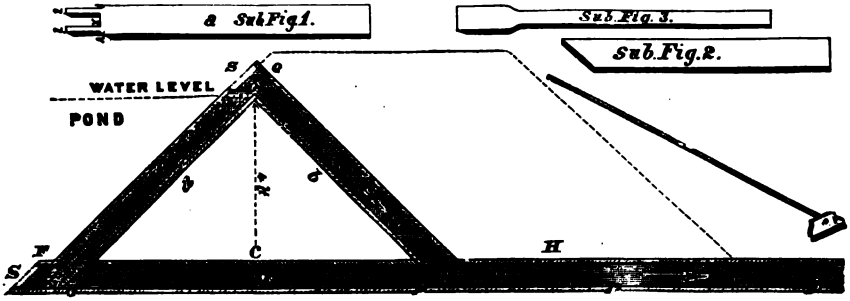


CONTOURS FOR CARP POND BOTTOMS. (Peirce's Method.) See page 210.

around the artificial feeding places. Carp cannot be raised by any system of artificial feeding for much, if any, less than fifty cents a pound. It is probable that they will sell at about twenty cents a pound.

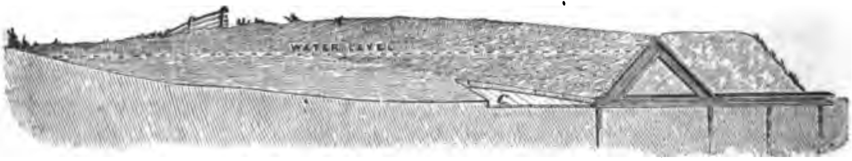
Granting now that my premises are correct, it must be evident that carp ponds should be constructed with especial reference to an ample supply of natural food within constant reach of the fish. To accomplish this, it is necessary that the water should be kept at the highest degree of temperature possible from atmospheric contact. Shallow ponds and sunny locations then are important factors. And another equally important requisite is that the surplus water discharges from the bottom instead of the surface of the ponds, thus constantly drawing off the coldest water. Warm water is absolutely necessary in order to produce a luxuriant growth of aquatic vegetation, as well as myriads of animalculæ. I have succeeded in accomplishing, as it seems to me, all that can be desired in this direction by my method of contours for pond bottoms, as shown by Figs. 14 and 16, and particularly by means of the pond-sluice, shown at Figs. 15 and 16. Simple as is this device, it is the result of many years' experience in the construction of fish-ponds. If anything more simple, cheap, or effective can be devised, I shall be pleased to recommend and introduce it.

FIG. 15.



SECTIONAL VIEW OF PEIRCE'S CARP POND-SLUICE. See pages 210 and 212.

FIG. 16.



CROSS-SECTION OF CARP POND THROUGH COLLECTOR, SLUICE, AND EMBANKMENT. See pages 210 and 213.

Directions for Construction.

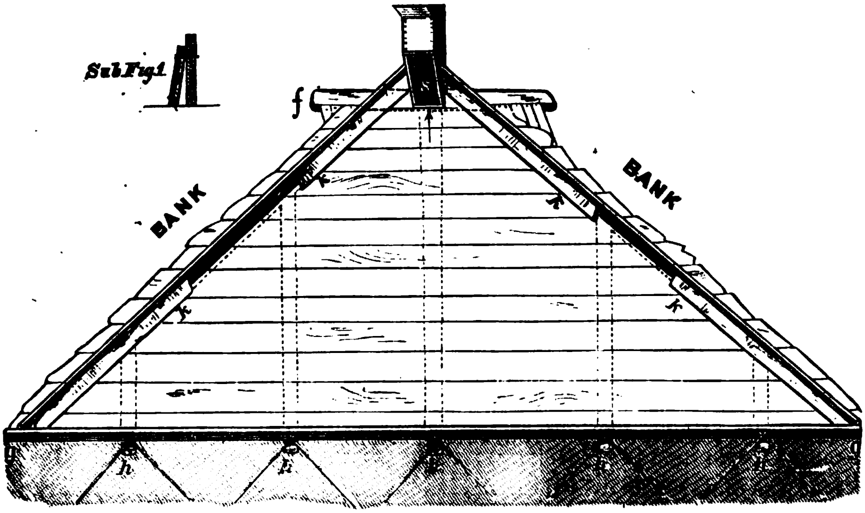
These sluices are made of common inch lumber or of thicker material up to two-inch plank. I use inch lumber in most cases. Fig. 15, which is drawn to a scale of one fourth of an inch to the foot, represents what I term a six-inch sluice. Some hydraulic engineers would term it thirty-six inch, because its inside diameter is six inches square, and it is capable of discharging thirty-six square inches of water. The one here shown is for a pond four feet deep at the dam, the inner apex at *o* being four feet above the bottom of the sluice at *d*. For the lower section of the sluice it is advisable to have the side and bottom boards (or planks) run the full length, which, in this case, should be about seventeen feet, it being fifteen feet through the base of the embankment. If this is not practicable it will, of course, be necessary to splice sides or bottom or both. For a six-inch sluice the sides (of both upper and lower sections) are six inches wide; the top and bottom being eight inch. The bottom of the lower section is first nailed upon the sides, thus forming an open trough. Next prepare the board shown at *a*, Fig. 15, as it appears at sub-Fig. 1. This board must be eight inches wide and say six feet long. The lower end must be cut away as shown at *vv* and *x*, leaving the tongues terminating at *ii*. The cut at *x* should be a little below the shoulder cuts at *vv*, and these shoulders, as well as the ends of the tongues, at *ii* must be cut at an angle of forty-five degrees, so that when the board is placed in position as shown at *a*, Fig. 15, the shoulders will fit the upper edges of the trough, and the ends of the tongues (*ii*) fit the bottom of the trough at *G*. The cuts at *vv* should be just sufficient to allow the tongues to slide down inside the trough at *G*. They should be about five eighths of an inch thick, and should be firmly nailed to the sides of the trough with small lath nails from the inside. These tongues are continuous bearings for the gate to slide upon and rest against, to which reference will be made further on. When the board is placed in position as shown at *a*, Fig. 15, it must stand at an angle of forty-five degrees with the trough or lower section of the sluice. Before the board *a* is fastened, measure from the extreme lower point of tongues *i* (at *G*, Fig. 15,) along the base joint of the trough to *d*, just four feet. From this point tack on a "stay-lath" (the right-hand edge of which must be straight) at right angles with and perpendicular to the sluice, extending from the bottom of the side at *d*, just four feet to the apex point at *o*. The right-hand edge of stay-lath should conform to the dotted line *c*. At the upper edge of the board *a* reached by this stay-lath, mark and cut *square* off. This fixes the length of the board *a*, which will not vary much from five feet between the point thus cut off and the shoulders *vv*, (sub-Fig. 1.) Next prepare the board *b* forming the right angle to *a*, (Fig. 15.) This must be a perfect counterpart to *a* without the tongues, but should be cut one inch shorter. When placed in position as shown in Fig. 15, it will with *a* form a perfect right angle. Before it is fastened in place its lower resting place should be marked, and then the lower cap-board *c*, each end cut to an angle corresponding to the position of *a* and *b*, should be placed in position as shown in Fig. 15 and nailed. The end of the cap *c*, to which *a* is to be nailed, must be eighteen inches from the end of the trough at *s*. Next *a* is nailed firmly to the sides of the trough and to cap *c*, and the tongues also nailed as before described. Next *b* is nailed at the bottom to the trough and to the cap *c*, then the upper end slipped ***under a***, which is nailed to it, thus forming the apex at *o*. The next step is to prepare the four side pieces for the upper section. These are, of course, six inches wide and are shaped as per sub-Fig. 2. When in position their shorter edges rest respectively upon *a* and *b* so as to form continuous sides, the angular ends fitting the upper edges of the trough to which they are nailed by *toeing* from each side. They are then nailed along the whole length through *a* and *b*. The sides for *a* should extend only to the apex at *o*, while the sides for *b* should extend across the ends of the others, and should be *toe-nailed* to them. The next step is to place the cap boards upon these sides. The cap for *a* should extend about two inches higher than the water line or apex at *o*. The cap for *b* should extend to within seven inches of the upper apex above *o* as shown at *e*. This leaves a full opening to the *a* section to permit sliding in a gate for closing the lower section at *G*. Before nailing the cap to the *a* section it will be advisable to make and fit a gate. There should be no cleats or any other device for holding the gate in place. The pressure of the water will do it effectively. By pushing the gate down till it slides away from its bearings, then drawing it back, and pushing down again, repeating the operation two or three times, its proper position can be readily found. When finally closed, two or three shovels full of loamy earth should be thrown down the section upon it, and washed in place with a bucket of water. This will render it water-tight. If cleats were placed over the gate, pebbles or dirt would be liable to prevent closing the gate properly, and also to wedge it fast, and prevent opening it when desired. The gate should be one eighth of an inch narrower than the space in which it slides, to prevent swelling and wedging fast. Gates for this purpose are shown by sub-Fig. 3. When in position, their stems should reach only to *O*. A short cap, fitted to the opening, and screwed in place, as shown at *e*, will prevent any tampering with the gate. For additional safety, the bank should cover this short cap. The removal of three or four shovelfuls of earth will give access to it when necessary. The lower section may now be cut at an angle, as shown at *F*, leaving a projection of about eight inches, to be covered with a cap, as shown, and the balance of this section also covered, as shown at *H*. Screens may now be placed over the openings at *SS*, and the gate slid into position from *O* to *G*, and the sluice is complete. The screens should be of strong galvanized wire, three meshes to the inch, and should be fastened to the sluice with carpet-staples, sometimes called double-pointed carpet-tacks. If these cannot be obtained, blind-staples or large-headed tinned carpet-tacks can be used.

The sluice is now ready to be placed in position. We will suppose that the embankments have been completed, except the opening which is to receive the sluice. The bottom of this opening is a ditch, a foot or more in width, and at least three inches deeper than the " collector " excavation, shown at *C*, Fig. 16. The outer end of the ditch should be enough lower than the inner end to draw all the water from the collector excavation. If the nature of the ground will admit of the driving of board or plank piling, there should be three driven to firm foundation across the ditch, so that when the sluice is in position, the points marked *p*, *p*, *p*, Fig. 15, will rest upon them. The upper end, at *S*, should rest on the foundation of the collector, which will be described elsewhere. The piling should be on a true grade, the outer one about one inch lower than the inner one. If pilings cannot be driven, then blocks should be bedded across the ditch on a firm foundation and true grade.

We will now suppose that the excavation has been made for the collector, as shown at *C*, Fig. 16.

It is next in order to place the foundation timbers for the collector, as shown at *C*, Fig. 16. These timbers may be common 3×4 inch stuff. The first one to be laid is at *f*, Fig. 17. It is laid at right angles with the sluice-ditch, and entirely within the pond, at least eight inches away from the bottom slope of the embankment. This timber should be five or six feet long. The point, where it is bedded, should be the extreme lowest point in the pond, for on this is to rest the upper end of the sluice, (as shown at *S*, Fig. 17,) which is to draw all the water from the pond when desired. It should be bedded perfectly level. Board piling

FIG. 17.



CARP POND-COLLECTOR, (PEIRCE'S PLAN,) SHOWING DETAILS OF CONSTRUCTION. See pages 213 and 214.

should be driven along its front nearly the whole length to a depth of two or three feet, if practicable, and level with the top of timber, and firmly nailed thereto. An edge view of these pilings is shown at left hand edge of sluice in Fig. 16, and nailed to the timber *f* in Fig. 17. The sluice may now be placed in position, the upper end to extend, say, two thirds across this foundation timber, and to rest evenly on it and the pilings or blocks across the ditch, the lower end to be one and one half or two inches lower than the upper end that the water may pass off readily. When in position, nail through the end into the timber, and also through the edges into the foundations along the ditch, so as to keep in place while being "puddled," (which will be described further on.) Have the sluice square on its foundations, and its upper section plumb. Now fit and bed the wing-timbers, as shown by dotted lines at *g*, *g*, Fig. 17. The ends next to the sluice must be cut to the proper angle, and firmly nailed to the timber *f*, preferably about six inches away from the end of the sluice, and exactly level with the timber *f*. The other ends should be about one inch higher. For the hatching-pond, these timbers should be about ten feet long, and should be placed at an angle of about forty-five degrees to the line of the sluice in all cases when practicable. The other timbers are to be fitted, placed, and nailed, as shown by dotted lines at *h*, *h*, *h*, *h*, *h*, in Fig. 17. They should be about four feet apart, and leveled across from the ends of the wing-timbers. When fastened in position, the earth should be filled around, and level with the top of them. The floor may now be laid and nailed to these timbers, as shown in Fig. 17. Very common inch boards will answer. The ends should project well over the wing-timbers, as shown, in order to receive sufficient earth to hold the platform in place, otherwise the water would float it. The sides of the collector may now be placed in position, as shown, directly over the wing-timbers, fitted, and nailed to the sluice, and firmly toe-nailed into the wing-timbers. Most of the nails to be driven from the outside edge. These sides for the hatching-pond should be about four inches high. After these are in place, other pieces, at least, half an inch narrower should be placed in a bracing position on the inside, as shown by broken sections at *k*, *k*, and end view at sub-Fig. 1, and toe-nailed down into the platform, and also nailed through, near the top edge, into the outer side board, as shown in sub-Fig. 1. This prevents the earth forcing in the sides. When the two sides are completed, a similar construction must be placed across the broad end, only it should be about half an inch lower. After this is completed, the ends of the timbers should be staked down as shown at *h*, *h*, *h*, *h*, *h*. These stakes should be similar to fence palings, driven as shown, the first nailed to the collector, and the second nailed to the first, and both sawed off level with top of collector. This arrangement will effectually prevent the collector from floating. The bottom of the pond may now be graded, even with the top of the collector. The space in the form of a semi-circle, as shown by the dotted line from corner to corner of the collector, (Fig. 14,) should be level and composed of clear earth, so as to form mud for the carp to hibernate in. For the hatching pond, this mud should be at least six inches deep. The balance of the central portion of the pond should be oviform, or the shape of a turtle's back, as shown in Fig. 14, sloping from the upper end gradually to the hibernating ground without any decided ditches, yet with a gentle depression around the turtle-form, and then rising very gradually to the water's edge. The object of this form of bottom is two-fold: First, to render the larger portion of the pond shallow; and, second, to prevent the carp from crowding together while the water is being drawn off. Otherwise, a large portion of them would be liable to be lost in the mud. The only way they can all be saved, is by means of the "collector," into which they will gradually collect when the water is drawn, as must now be evident.

We now come to one of the most important details of carp pond construction, namely: The "puddling" of the sluice. This may be done before or after the construction of the collector, but preferably after, because of the convenience of controlling the water which, perhaps, is already running down the ditch. If, however, the site is a dry one and the water is to be artificially introduced, it should now be turned in and the sluice-gate closed. The first preparation for puddling is to form a dam across the lower end of the ditch, carefully filling under and around the end of the sluice and over it at least a foot in height. The water should now be let into the ditch till the sluice is at least half covered with it, and, starting at the lower end and gradually along the entire length, commence throwing in small quantities of clear earth or sand, mixing it thoroughly with the water so as to form a thin puddle. A smooth round pole not over two inches in diameter at the larger end is the best possible implement for this purpose. At first, the filling and puddling should be entirely on one side in order to ascertain on the opposite side when the puddle has worked entirely underneath the sluice. It will now be understood why the sluice should be at least three inches above the bottom of the ditch, and also why the puddle should be very thin, for otherwise it would not fill every crack and crevice which is absolutely necessary. This portion of the work cannot be done too thoroughly. When the puddle has filled under the entire length of the sluice so that it begins to come up upon the opposite side, the process may continue on both sides until the lower section of the sluice is surrounded and covered at least one foot with thin puddle. The bank across the lower end may now be carried up according to the slope of the dam, and up the ditch to within say a foot of the upper section of the sluice. Good, strong sods should be cut for the pond slope of the upper section of sluice. These sods should be carefully placed on each *side* of this section, so that the cap only will be in the water of the pond when filled. The sods should be "winged out" each way, so as to hold the puddle *which must be carried up continuously* *to the top of the upper section.* The sod work can be carried up gradually on the same slope as the upper section of sluice, and at the same time the other end of the ditch can be carried up with dry earth, keeping the same constantly at least a foot away from any part of sluice, the lower slope of which must be entirely surrounded, and the entire space between both slopes kept filled with thin puddle. Of course a bucket will be required to bail water from the collector over the sod bank while the puddling progresses.

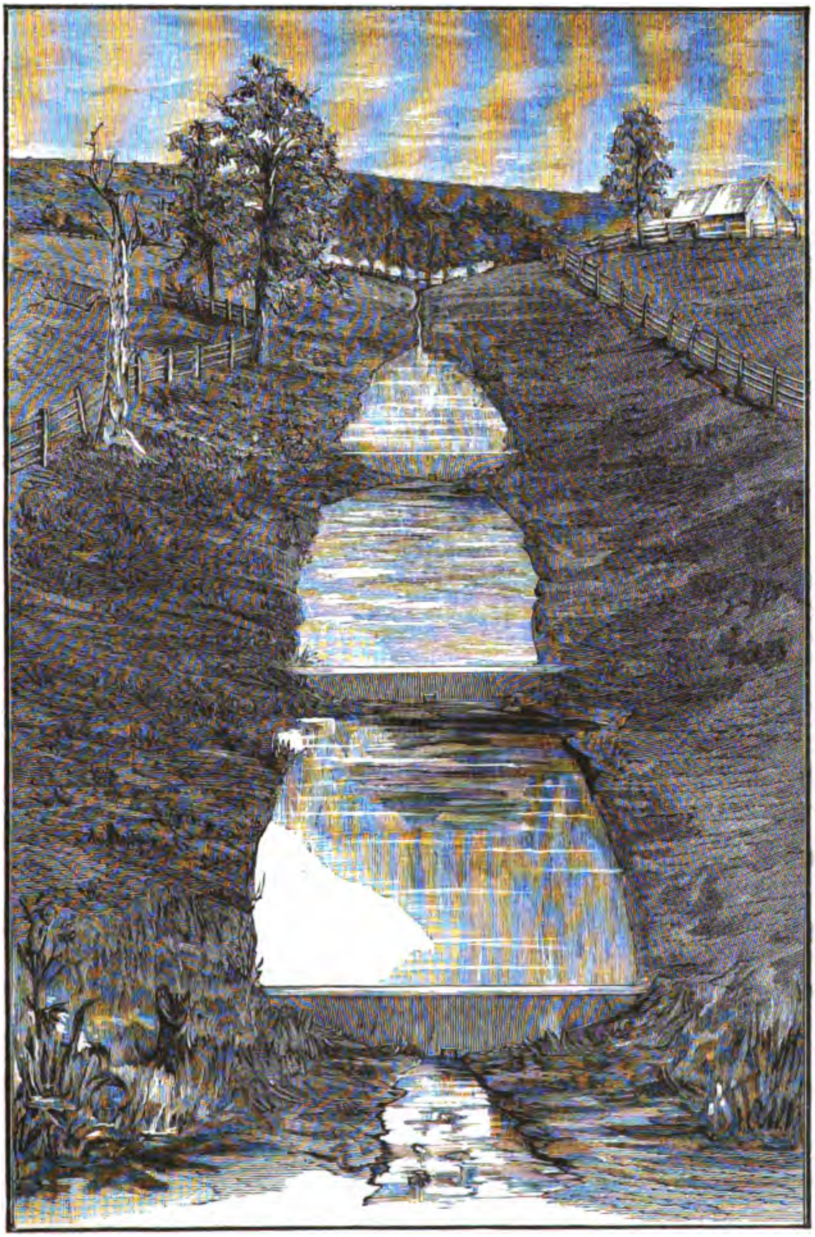
Embankments.

I will now proceed to give general instruction for the construction of hydraulic embankments. When the site for the same has been fixed, a trench three or four feet wide must be excavated the entire length, down to a firm foundation, and all roots and other débris thrown out. This trench must now be filled with clear, pulverized earth, (or soft mud,) and all the water side of the embankment carried up with the same material, while all sods, &c., must be thrown to the outside of the embankment. The foundation trench should be nearest the water slope, so that the fine earth may settle together and thus become impermeable to the passage of water. If the water of a pond is to be four feet deep at the collector, the bank should be carried up five feet high at this point, which establishes the level for the entire bank. At this point, the embankment must be fifteen feet wide at the bottom and five feet wide at the top, and the top width should be maintained the entire length of the work, while the bottom will vary according to its varying height, being always three times as wide as the height. These dimensions leave the slope of the banks at an angle of forty-five degrees, at which angle dry sand and fine, dry earth will cave. No masonry or lumber, beyond that already mentioned, should be used in the construction of carp-pond embankments, except in extreme cases when outside waters are liable to wash them. Masonry and wood work afford burrowing and hiding places for muskrats. After the embankments have been constructed, as directed, all those portions below the water-line can be covered with broken stone. small cobble stone, oyster shells, or tin scraps, either of which will effectually prevent the depredations of those pests. Another good plan is to use slate, or other *thin* stone, setting them up edgewise, *perpendicularly*, and if the edges are not straight, break joints, like the slating or shingling of a roof. This thin barrier should commence at the bottom of the foundation ditch, and be carried up continuously through the embankment above the water level. Thinness and perpendicularity are absolutely necessary, in order to allow a free settling of the embankment. It is always advisable to sod embankments on the outside.

Locations.

The location of sites for carp-ponds is really one of the most difficult problems in connection with the business. When practicable, the services of a hydraulic engineer should be secured. If necessary to obtain such services from a distance, neighborhoods should join and share in the expense. It will be found to pay. A careful hydraulic survey is always

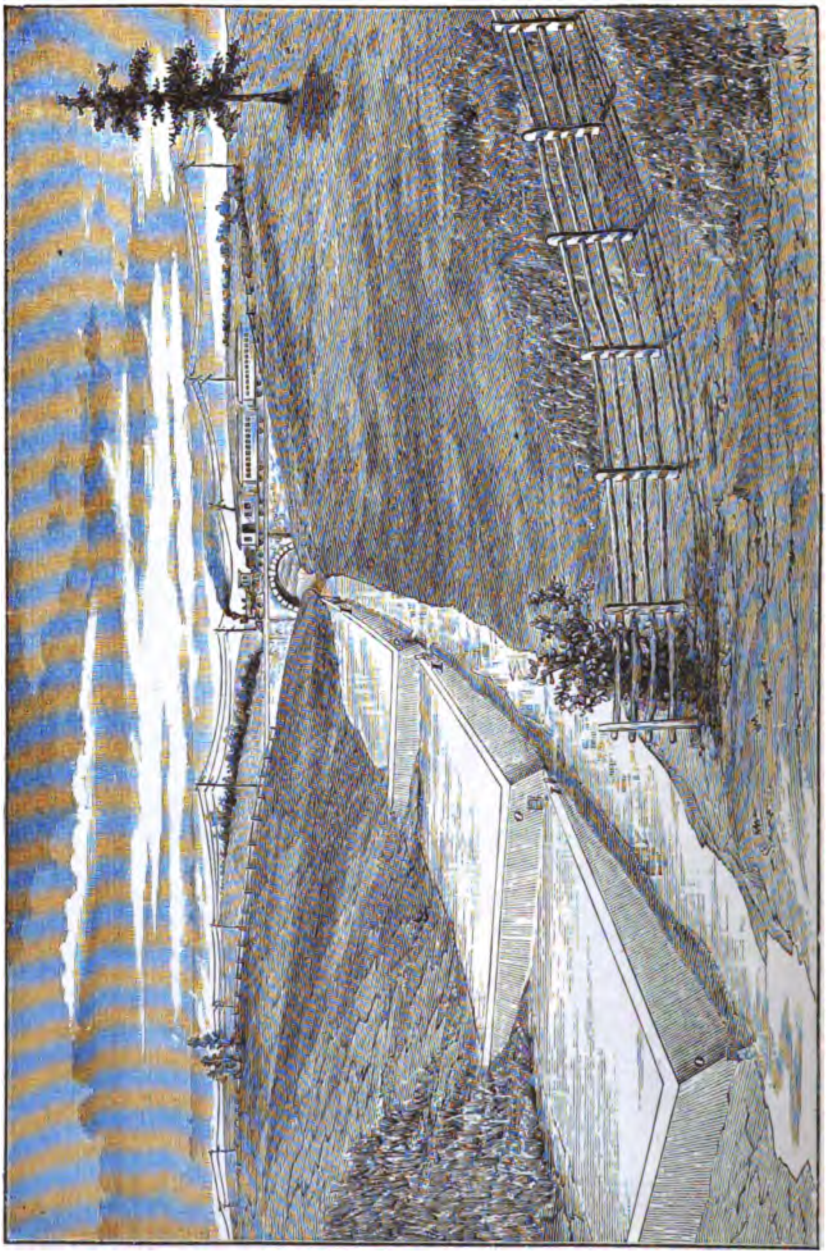
FIG. 18.



PONDS CONSTRUCTED AT THE HEAD OF A VALLEY. See pages 219 and 220.

necessary. It does not come within the scope of this pamphlet to give instructions in hydraulic engineering. As no two sites are alike, no

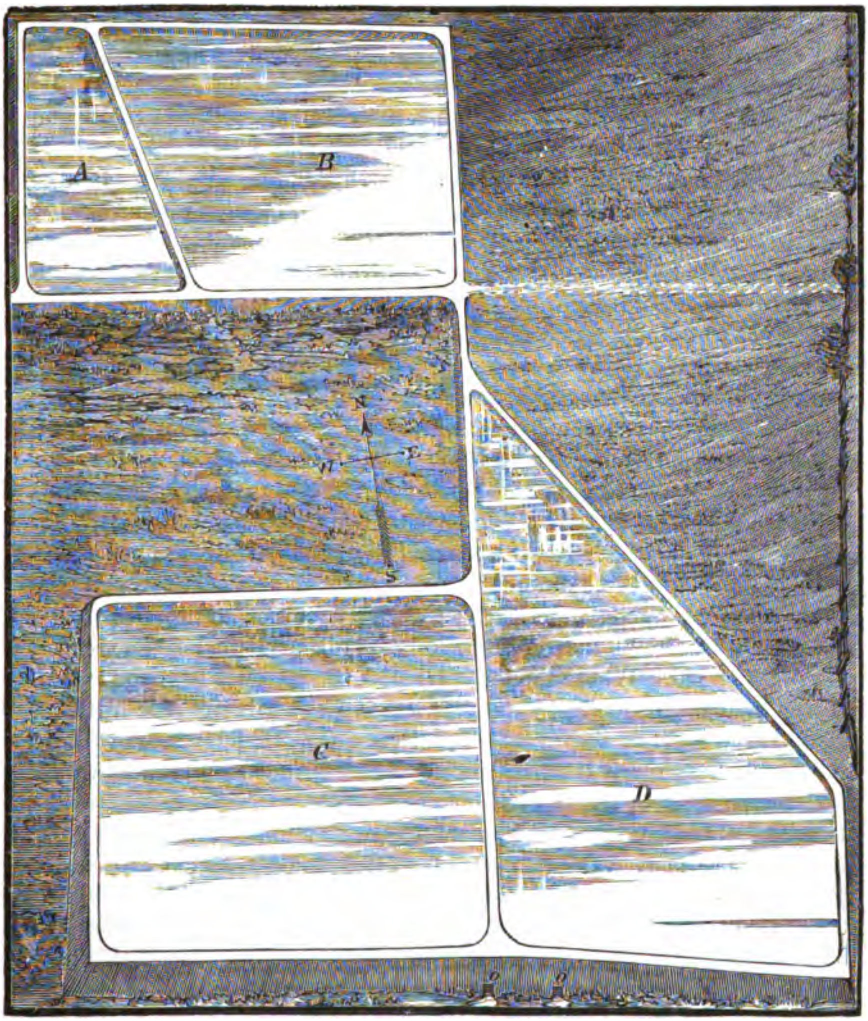
FIG. 19.



PONDS BY THE SIDE OF A STREAM CONTAINING A SURPLUS FLOW OF WATER. See page 220.

general instructions can be given will cover all locations. It is an easy matter to construct on paper, an ideal fish-pond, and they can thus be made to look "very pretty." When it comes down to real practice, water is very obstinate; it will either overflow, or else not reach the ideal limit. After an extensive practical experience, I find that a majority of practicable carp-ponds may be classed in three principal groups. The first are those which may be formed by the construction of a single embankment, as shown by Fig. 18, page 33. The second are those which may be formed by two embankments, (*i. e.* two sides,) as shown by Fig. 19, page

FIG. 20.



CARP PONDS OF BANNER THOMAS, ESQ., NEAR ABSECON, N. J.
See pages 220, 221 and 224.

34; and the third, those formed by nearly or quite surrounding embankments, as shown by Fig. 20, page 35. These groups represent actual ponds partly or fully constructed, and generally already stocked with carp. They are, therefore, in nowise ideal. Ponds substantially as represented by Fig. 18, have been planned by the author for Hon. William Parry, Parry P. O., Burlington county, New Jersey; George Hamel, Esq., Weldon, Montgomery county, Pennsylvania; Lorenzo D. Zimmerman, Centre Square, Montgomery county, Pennsylvania; Samuel Wilkins, Esq., 329 Market street, Philadelphia, Pennsylvania; Hon. William A. Wood, Pittsgrove, Salem county, New Jersey; George W. Hill, Esq., Clayton, Delaware, and a number of other gentlemen in Pennsylvania and New Jersey. Ponds substantially as shown by Fig. 19, have been also planned for Robert U. Jacob, Esq., Lewistown, Mifflin county, Pennsylvania; Edwin Tomlinson, Esq., Byberry, Philadelphia county, Pennsylvania; Charles P. Atkinson, M. D., Palatine, Salem county, New Jersey, and several other gentlemen in both Pennsylvania and New Jersey. Ponds on the plan substantially of those in Fig. 20, have been planned for Banner Thomas, Esq., 117 Market street, Philadelphia, Pennsylvania; Joseph Pyle, Esq., West Grove, Chester county, Pennsylvania; Joseph C. Hinchman, Esq., Medford, Burlington county, New Jersey, and a number of others in both States named.*

The class of ponds represented by Fig. 18, must be located with much caution, and only at the extreme heads of valleys where the water-shed is very limited, otherwise they are liable to overflow during heavy rains, thereby cutting away the banks and washing out the fish. If there is any danger from such a contingency, it is advisable to adopt the plan represented by Fig. 19, as the flow of water can thereby be fully controlled. The illustration fully explains their construction. The letter *I* indicates inlets, the letter *O* outlets. It will be perceived that the outlets are located in three different ways, viz: at the side, at the end, and at the corner. When practicable, I prefer a corner outlet, principally because it admits of the collector (Fig. 17) being built across the corner of the pond. Where the ordinary flow of the water in the stream is all required for a sufficient supply, it is necessary to discharge from one pond to the other as shown by the outlet of the middle pond, but when the supply is ample, it is advisable to have independent inlets and outlets for each pond, in order that either may be emptied or filled at pleasure. In case there is danger of surface water coming into ponds of either class, it must be turned away by means of a ditch and conducted around the ponds. The third class of ponds, and one that will be likely to be extensively constructed in comparatively level regions, is that shown by

---

* The names and address of the foregoing persons are given, for the reason that a reputable, (but not well-informed,) paper, published in the suburbs of Philadelphia, and much quoted, denounces systematic carp culture as a humbug. Persons desiring information from any of these gentlemen, can probably obtain the same by writing and enclosing stamp for reply. I am not certain that Mr. Jacob has, at this writing, finished his ponds.

Fig. 20. But few persons believed it possible to construct ponds upon the site here shown, nor was its feasibility determined until a careful hydraulic survey had been made. In carrying out the details of construction, the levels have been maintained to the fraction of an inch. The site occupied by the ponds was nearly level, with a very gradual slope to the south, there being a decided rise to the northward and eastward from the outer line of embankments as shown. The sites *A* and *B* contain numerous small springs. The southerly and westerly portions of site *D* contain copious springs. All the land shown south of *A* and *B*, including *C*, was dry and in wheat stubble. The southerly embankment of *A* and *B* is a farm road. All the embankments, except the northeast and east embankments of pond *D*, were along the line of ditches. Each of the ponds can be filled or emptied independently. The water from *A* and *B* can be run into either *C* or *D*, or divided between them. *A* is the hatching pond, *B* the nursery pond, and *C* and *D* stock ponds. On account of its site being clear, pond *C* was first constructed, and was stocked with a few carp, tiny little fingerlings, on the evening of December 31, 1881. On the first of May, 1882, their growth had just commenced. About the last of October, when barely fifteen months old, they were removed to pond *D*. The smallest were seventeen inches long, the largest twenty-two inches long, and weighed seven pounds each. Such a growth would have been impossible, but for the peculiar construction of the sluices which raise the temperature of the water in summer from ten to to twenty degrees. *Per contra*, they also lower the temperature in winter, thereby increasing the value of the ponds for ice, without in any wise interfering with the carp, which are then in the mud. The embankments of this set of ponds are extra heavy, being eight feet wide on top, admitting of the driving of a carriage around all the ponds.

Most sites for ponds, like these, will probably be on entirely dry land, often on that which has been cultivated. Ponds prepared in dry locations have the advantage of being free from other fish, lizards, water-snakes, &c., all of which are enemies of the fish culturist. Ponds in such locations can be finished and surrounded with fine screen-wire or tight board fences three or four feet high, and thus secured against the intrusion of the enemies named, and such additional ones as eels, (which will scale a bank of dry earth and destroy large quantities of young fish in confined enclosures,) turtles, rats, minks, ducks, and geese, all of which are destructive of fish. Even hens will catch large numbers of them. One of the worst enemies to be found in some States, is probably the snapping-turtle. These can be readily caught with large hooks, baited with fresh meat. The hook should be attached to brass or copper wire, as the turtle will bite off an ordinary fishing-line. If ponds are located so as to be infested by kingfishers, herons, &c., they must be shot or trapped. Kingfishers can be killed by anchoring a piece of mud-colored board two or three inches beneath the surface of the water and fastening a fish on top of the board. The kingfisher, in diving after the fish, will strike the board with sufficient force to kill itself. Muskrats should be vigilantly trapped or otherwise destroyed, as they endanger the embankments by burrowing. A sharp little English rat-terrier is one of the most valuable of fish-pond sentinels.

It is advisable to drain off carp ponds every fall and spring, in order to remove the carp of different ages to their proper ponds, to trap within the collector other varieties of fish, which sooner or later, are sure to be found in the ponds, and also to find any carp which may have become diseased. Fish diseases are generally characterized by fungus growths, gelatinous polyp, &c., readily visible. All fish thus affected should be consigned to the compost heap. Only the best specimens should be selected for breeders.

In Europe, two or three pairs of spawners for a hatching pond of one acre is considered sufficient. These will be almost certain to produce more young fry than can be properly maintained in a pond of that size for the season, and enough to stock a nursery-pond of several acres. About five hundred (two-years-old) fish from the nursery-pond is sufficient for an acre of stock-pond. If this pond is properly supplied with aquatic plants, the five hundred fish introduced in the spring would be fit for market the next October and November, at which time they should weigh fully one ton.

It is believed that carp will command higher prices than shad. The reader now has some tangible data from which to figure the probable profits of carp culture. The profits can probably be materially enhanced by placing the fish a few weeks before marketing into large vats supplied with running water, and feeding them all they will eat, very much as chickens are prepared for market. They can be fed upon various kinds of kitchen refuse, but it is probable that boiled sugar-corn would be unequalled as a fattening food, both for increase and flavor. All food should be cooked, (steamed or boiled.)

Fattening vats should be constructed with false bottoms composed of galvanized wire-screen, sufficiently fine to prevent their food dropping through, but open enough to pass through all filth. A shallow gate should be arranged, opening across the entire end of the vat, to admit of fully "flushing" the same, (daily,) and thereby clearing out all foul matter. Fattening vats should be covered with large, open mesh, fine wire-netting. A fattening "Boat" is shown in Fig. 14, sub. Fig. 1, page 25. The sides of this boat are composed of two-inch pine plank, or even one-inch boards. The bottom is of fine wire-screen, same as false bottom of fattening vat, and the top of fine wire, open mesh, galvanized netting, as shown in the illustration. This boat can be anchored in any pond or stream of clean water, convenient for feeding the fish.

All sluice and other screens should be of netting, galvanized *after* weaving. This prevents the wire from moving while being cleaned. A suitable brush for cleaning clogged screens is shown on the right of the embankment in Fig. 15, page 26. If the water is seen running through the upper screen of the sluice, it shows that the lower screen is clogged and should be at once cleaned, that the water may draw from the bottom.

I receive many inquiries as to the table qualities of the carp. Doctor Hessel, referring to this point, says: "If the carp were a fish of inferior quality, like the buffalo fish, for instance, its sales would doubtless be limited to the sea-port towns of Northern Germany and the principal cities of Central Europe, as Vienna, Berlin, and Paris. In the latter city, in spite of an abundant supply of salt-water and different kinds of fresh-water fish, the carp is ever preferred to these, and, with the exception of trout and salmon, it frequently commands a price three times as high as that of all the rest.

I maintain my assertion that the carp is one of the most excellent fresh-water fishes, and its introduction will be of great value in point of national economy, especially on account of the facility of its culture and the enormous extent to which this may be carried on.

The carp and its value as a fish of culture will before long be fully appreciated, so that we may be enabled favorably to compare the results of its culture in America, as also the extent attained to, with any other country, to our complete satisfaction."

I have conversed with several gentlemen who have eaten our food carp, and they all prefer it to the universally prized shad.

Miscellaneous Observations.

In this concluding chapter, I propose to cover as briefly as possible, by paragraphs, such points as could not be conveniently introduced into the foregoing pages, other points which have been inadvertantly omitted, answers to questions asked by correspondents, &c.

I wish to warn all attempting carp culture for profit, against endeavoring to learn by their own experience, for the mass will find life to short to acquire such a knowledge of it as can be attained in a short time by availing themselves of the experience of others. Let those having leisure and means make experiments. No others can afford it. There will be a vast amount of misdirected carp culture in this country for a few years to come, and an immense aggregate loss of time and money wasted in consequence. Please remember this "note of alarm."

Carp culture is practicable in all parts of this country, and eminently so in the middle and southern States and Territories. When properly conducted, it will pay well anywhere in the north, but it will be necessary to construct the ponds deeper near the outlets, than further south. In the northern States and Territories the deepest portions of carp ponds should be from five to seven feet, while in the south they should run from three and a half to four feet. The larger portion of the area of ponds, both north and south, should not exceed two feet in depth.

It is not advisable to stock open streams or large bodies of water with carp, for reasons already given. In a few years there will be millions of surplus *young* carp in this country. Place *them* in streams, &c.

Referring back to Fig. 14, I will say that the oviform sections of carp ponds here described should be preferably located, so as to run from the hibernating ground to the *extreme* opposite point of the pond. Thus, in pond *C*, Fig. 20, page 35, the ridge is located through the pond from north-west to south-east, while in *D* the oval conforms to the general shape of the pond. On the site of pond *B*, however, there were established two broad ditches, dividing the pond into three sections, running north and south. The bottom of this pond, therefore, is composed of three ovals, while *A* has one, corresponding to its general shape. This shows that the engineer, in laying out carp ponds, must conform his work to circumstances In this connection I will say, that it is impossible to lay out ponds properly, without a hydraulic survey of the sites.

Beware of the party that professes to make *improvements* on the modern plans and devices herein published and which are not patented, but are now the property of the public. Let the so-called improvements be made in some other pond, not yours. Notify me of all alleged improvements. In almost every possible case they will be found to be something tried and discarded by me, years ago. Everything of merit, I will aid in introducing.

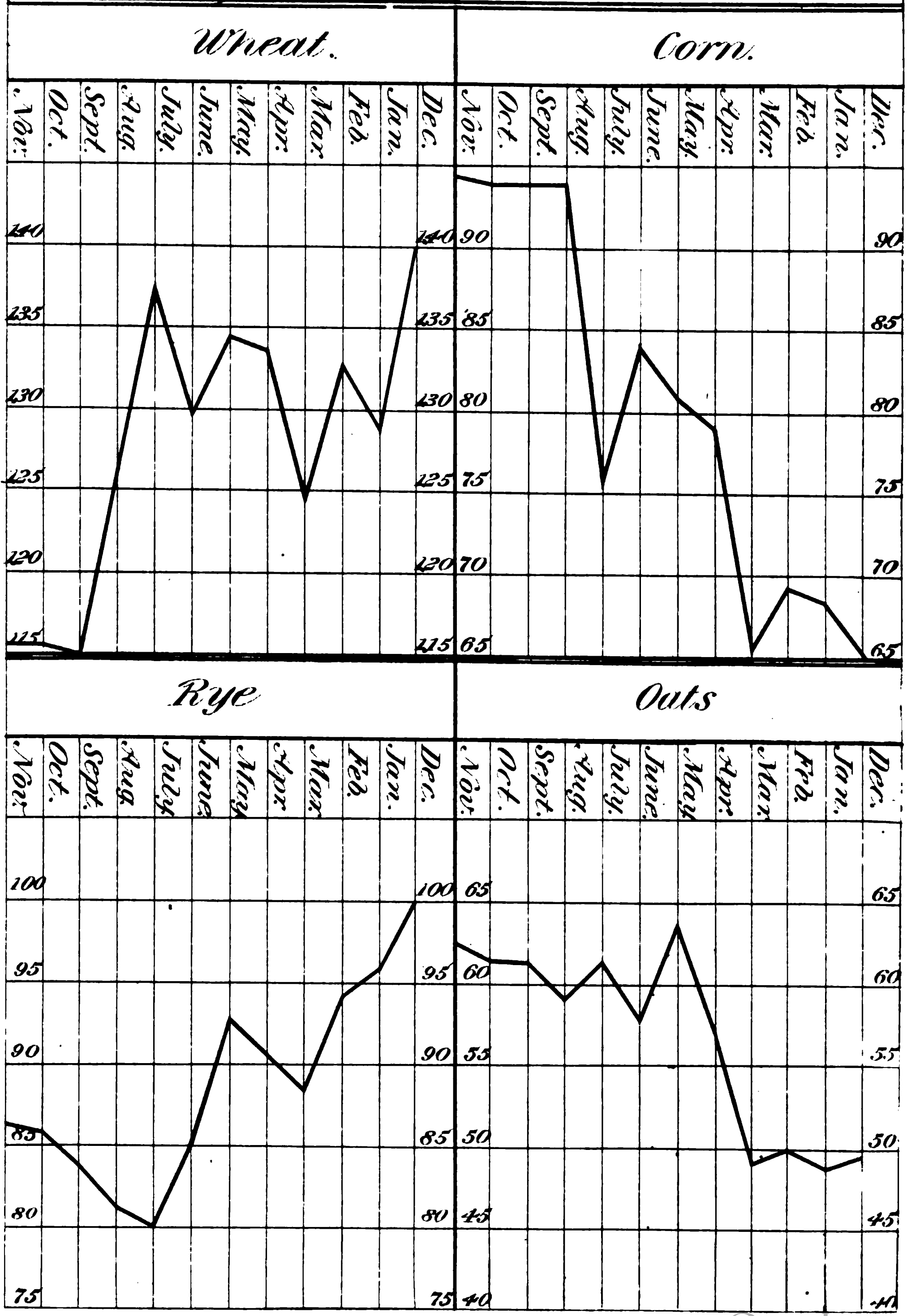
In drawing the water from carp ponds, keep away from the outlets after the water is nearly out, at least keep out of sight of the fish till they are all in the collector, and then approach them gently. Do not frighten them; they may be driven into the mud and suffocated. If carp burrow into the mud deliberately and entirely of their own accord, there is no danger. They will thus live in mud for months after the water has disappeared, providing the mud keeps soft. Deformed fish, some striking monstrosities, are occasionally found when clearing ponds or changing the fish from one pond to the other. All such fish should be thrown out.

Don't believe quite all you hear or read of carp, unless you read it in the newspapers. [The author has been a "newspaper man" some thirty years.] If you hear any one tell of calling carp by whistling, blowing a horn, ringing a bell, &c., suggest the propriety of imparting such information to the marines. If you desire to investigate the proclivities of such informants, ascertain their views as to moon-theories, the goose-bone, the divining-rod, and—Vennor!

And this reminds me of "indications" and "probabilities." The indications at the present time render it probable that carp culture in this country will become universal in the near future. That every farmer and ruralist having facilities, will engage in the business to some extent. That people in preparing their carp for market and the table, will no more take them out of the water and let them smother and die, than they would drown their pigs and poultry for similar use. That carp will be sent to market in tanks of water mounted upon wheels, in tank-cars, tank-boats, &c., and that in market they will be kept in tanks of water till their final sale for the table. That our people will consume less "butcher's meats," and more fish, securing thereby an enhanced measure of health and happiness.

Pennsylvania Crops XII.

Prices of Grain Dec 1st 1881 to Dec 1st 1882



TRICHINÆ.

The trichinæ spiralis, though known to the scientific world since 1832, has recently been brought into public notice by the edicts which European powers have issued against the introduction of American pork. The investigations, both scientific and practical, which have been caused by this increased interest have developed the fact that this parasite exists to a much greater extent than had been supposed, but at the same time the same examinations have developed the true history of the pest, and, as a necessary adjunct to the proper appreciation of its habits and mode of propagation, have also furnished the means of guarding against its ravages. In a careful examination made by Prof. A. H. Tuttle, of the Ohio State University, trinchinæ were found in eight out of ten pieces of pork purchased in open market for the examination, and of fifty-one rats caught near the slaughter-houses of Boston thirty were found to be infected, and of thirty taken in another large slaughter-house all were found infected.

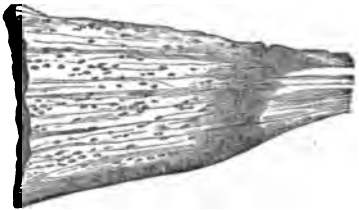


Fig. 1.

In referring to the fright which this parasite has caused in Europe, a foreign author writes as follows:

"No animal at any time has attracted so much attention as that little worm, which lives in flesh rolled up; it is about the size of a millet seed, and was found by chance in the dissecting-room of a London hospital some fifty years ago, (1832.) The plague and the cholera did not inspire so great fear, and this fright had almost passed from Germany throughout the rest of Europe. We were not among those who wished to take measures at all hazards against the invasion of this worm, since nothing induced us to believe that more trichinæ existed then in Belgium than in ordinary times."

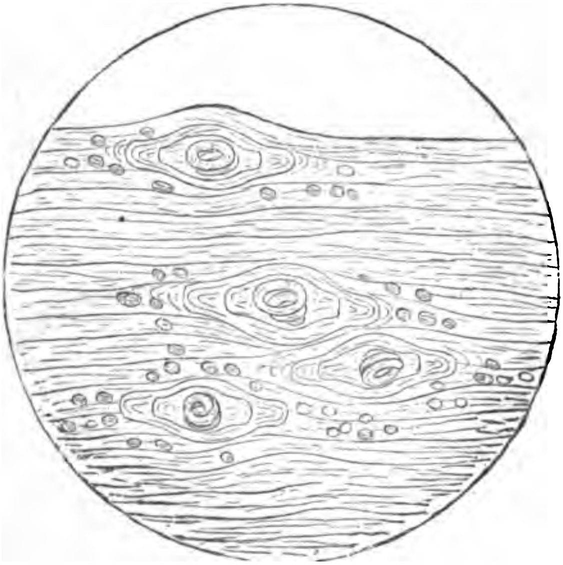


Fig. 2.

In referring to this parasite, Prof. James Law writes as follows: "This worm, which is capable of being reared in all domestic animals, is especially common in man, the hog, and the rat. Trichinæ are almost microscopic, varying from one eighteenth to one sixth of an inch in length, yet they are among the most deadly worms known. The mature and fertile worm lives in the intestines, the immature or minute cysts in the muscle. The latter can only reach maturity and reproduce their kind when the animal which they infest is devoured by another, and they are set free by the digestion of their cysts. When thus introduced into the bowels they grow and propagate their kind, giving rise to much irritation for the first fortnight, diarrhœa, enteritis, or peritonitis. The symptoms caused by their burrowing through the bowels and into the muscles lasts from the eighth to the fifteenth day. They are violent muscular pains like rheumatism, but not effecting the joints, a stiff semi-flexed condition of the limbs, and sometimes swellings on the skin. In man the affection is often mistaken for rheumatism or typhoid fever; in the lower animals the symptons are less marked, but are of the same kind. Their are loss of appetite, indisposition to move, pain when handled, and stiffness behind. If the patient survives six weeks, recovery may be expected, because the worms no longer irritate after becoming encysted in the muscle."

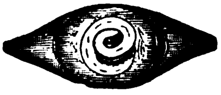


Fig. 3.

A noted writer thus describes the stages through which the trichinæ passes during its development.

"Like many other parasitic insects, the trichina has two stages of existence, in each of which it occupies a different animal. In one of these stages it is entirely powerless for mischief, and exists simply as a minute worm, about one twenty-eighth of an inch long and one six hundredth of an inch in diameter, coiled into a spiral form, and surrounded by a bag or cyst, which, when mature, is coated with a calcareous deposit. These cysts are found among the muscular fibers of an infected animal, and when fully mature may be seen with the naked eye, presenting the appearance shown in Fig. 1. As, however, the deposit of this calcareous covering requires some time, a piece of meat may be badly infested with trichinæ without presenting any such appearance as this. In such a piece, however, the presence of the parasite may be detected by cutting an extremely thin slice—so thin as to be transparent—and placing it under a microscope magnifying twenty-five to fifty diameters, when it will present the appearance shown in Fig. 2, the spiral position of the worms being distinctly shown. In Fig. 3, one of the cysts is shown as separated from the muscle. While the trichiæ remain in this condition their "host," or the animal harboring them, suffers no inconvenience from their presence; but if the raw flesh of this animal pass into the stomach of another, the calcareous coverings of the cysts are dissolved, the worms become active and increase in size, presenting the appearance shown in Figs. 4 and 5, which represent a male and female trichina respectively, highly magnified. As is the case with other worms of this class, the small end is the head. The sexes now mate and pass into the small intestines, wherein a few days the female produces from one thousand to three thousand live embryos, and then dies. The young trichinæ immediately bore through the walls of the intestines, and travel

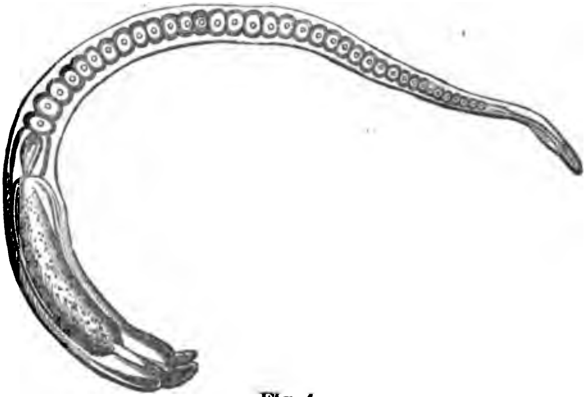


Fig. 4.

until they find themselves among muscular fibers, as in the diaphragm, or the muscles of the extremities, where they encyst themselves and prepare for their stage of quiescence.

It is the irritation produced by this migration of the young trichinæ which gives rise to the distressing symptoms following the eating of trichinosed pork, commencing with pain and fever of a typhoid character in the bowels, which soon extends to all parts of the body, and is attended with stiffness, swelling, and nausea, the attack frequently ending fatally in about four weeks, and sometimes much earlier.

Trichinæ generally affect only flesh-eating animals. The source from which man obtains them, is, therefore, the hog, although they have been found abundantly in dogs and cats, and especially in rats, the latter of which offer the greatest difficulties in the way of eradicating this plague, since they serve chiefly as the means for carrying it back to the hog, while their destruction seems next to impossible. Putrefaction does not kill the trichiæ, hence they may be carried into the bodies of cattle, horses, and sheep by drinking water contaminated with decaying trichinosed flesh, or with the excrement of trichinosed animals.

Trichinæ are not affected by the salting, smoking, or other curing operations to which pork is ordinarily subjected, nor by a considerable degree of heat; they may be completely destroyed, however, by the *thorough* cooking of the meat. Experiments have shown that in boiling a ham weighing twelve to thirteen pounds, the outside may be thoroughly cooked before the part next the bone has attained a sufficient degree of heat to secure the destruction of this worm. Thus, M. Vacher, of Paris, took a moderate-sized leg of pork and boiled it thoroughly for half an hour, when a thermometer placed within it to the depth of two inches and a half registered but 86° Fah.; after boiling an hour the temperature inside was 118°; after an hour and a half, 149°; and after two hours and a half, when the joint was considered to be well cooked, 165°—temperature which M. Vacher maintains to be still insufficient for the complete destruction of trichinæ. Pork should always be cooked until every vestige of the pink color shall have disappeared.”

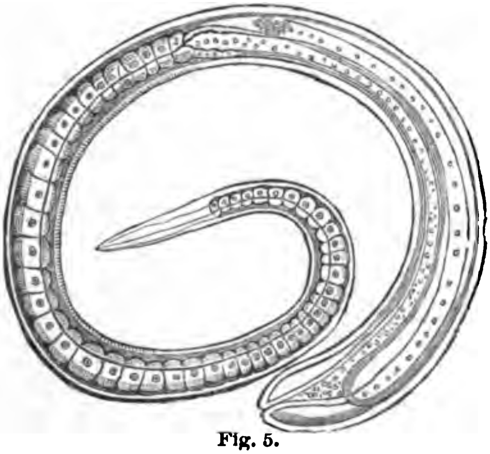


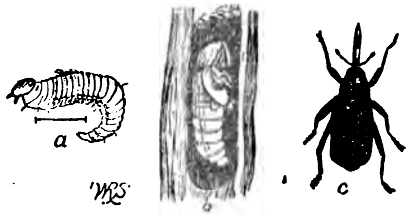
Fig. 5.

Of the rapidity of propagation Van Beneden writes “the *trichinæ* spiralis produces about a hundred young worms at the end of a week, (viviparous,) and a pig which had swallowed a pound of flesh (5,000,000 trichinæ) might contain after some days 250,000,000, reckoning, then, if one half the worms hatched were females, which is not the case, for there are more females than males.” In 1857 Leuckart counted 700,000 trichinæ in a single pound of the flesh of a man who had died from the effects of this parasite, and Zeuker asserts that even 5,000,000 may be found in a similar amount of infected muscle.

INSECT PESTS COMPLAINED OF IN 1882.*

The Potato Stalk Weevil.—*Baridius trinotatus.*

In the subjoined illustration *c* represents the beetle in a perfect state; *b* shows the pupa in the potato stalk; *a* the larva. The beetle is of a bluish gray color, with three black spots in the lower edge of the thorax. The female deposits her eggs singly in a small cut in the stalk. As soon as hatched, the grub makes its way into the center of the stalk, and by appropriating its juices, kills the plant. The larva of the weevil differs from that of the borer in having no legs.



The Apple-Tree Borer.—*Saperada bivittata.*—SAY.

A Union county correspondent sends us two specimens of what he supposes to be the male and female apple tree borer. Examination proves that they do not belong to the same family, one being the true *S. bivittata* and the other the flat-headed borer *Chrysobothris femorata.* Both burrow in the apple tree, but the former is the true apple tree borer and the one which does by far the most damage in Pennsylvania.

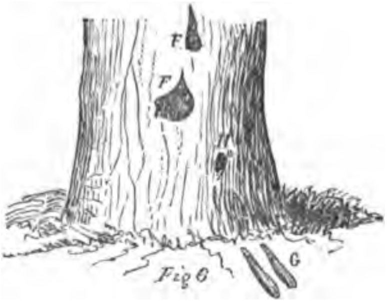


Fig 6

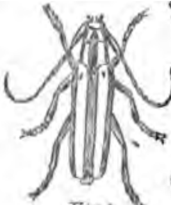


Fig 1

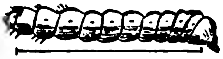


Fig 3

Fig 4

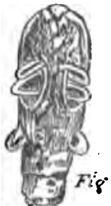


Fig 5

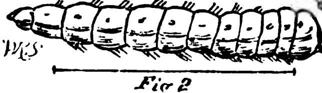


Fig 2

It issues from the body of the tree a perfect insect, usually in June and is nocturnal in its habits. Late in June, the female lays her eggs in the bark, near the roots, and in some instances in the bark near the principal forks of the tree; as soon as hatched the grubs bore into the soft bark and wood; in this form the insect exists three years, usually going downwards during the first year and upwards or horizontally the next years

When ready for the pupa state, the insect burrows to near the surface and just under the outer bark, from which it emerges in the beetle form, during June of its second or third year. In our representation of the various forms of this beetle; 1, shows the perfect beetle; 2, the full grown borer; 3, the borer at the commencement of the second winter; 4, lines showing its various sizes of growth; 5, pupa; 6, the manner of entering the tree.

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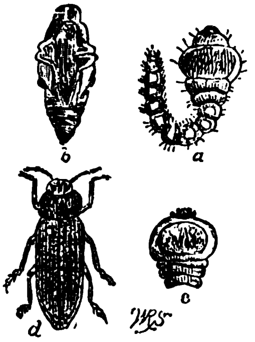
* Many of our correspondents forward to us specimens of insects which, at the time, are doing special damage in their respective districts. When the data at hand will warrant it, answers are sent direct from the office, and in other cases the specimens and inquiries are referred to the proper officer of the Board for answer. Those referred to in this article belong to the former class.

One of the most reliable remedies is to force a fine pliable wire into the opening made by the grub until it is destroyed by actual contact with the wire; another plan (less satisfactory) is to remove the bark over the burrow with a sharp chisel or gouge until the borer is reached.

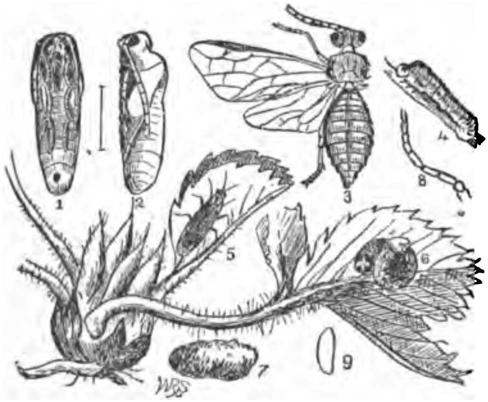
In our annual report of 1878, J. S. Keller member of the Board from Schuylkill, uses the following language "My experience is that prevention is better than cure, and that the best plan is to remove the earth around the trunks of the trees, three or four inches deep and wrap the trunks with heavy paper, well coated with coal tar, to make it impervious to water, or some kind of cloth, well coated with coal tar. The wrappers should extend high enough up the trunk to be above the grass. But to make sure, every tree so protected must be examined annually during the month of May, and when the wrapping is defective it must be restored."



The flat headeded borer—*Chrysabothris femorata*—differs from the S. *bivittata* not only in form, but also in the fact that it flies in the day time. In our representation of it, *a* shows the larva; *b* the pupa; *c* the head and segments of the body, and *d* the mature beetle.

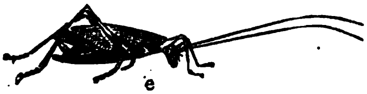
The Strawberry Worm.—*Emphytus Maculatus.*

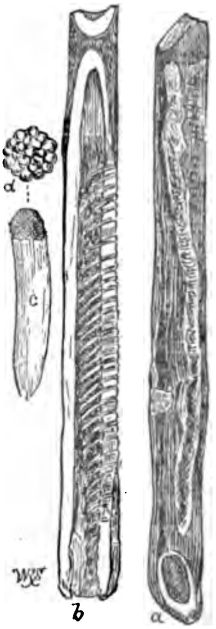
A York county correspondent complains of injury to his strawberry plants by the insect here represented. Its habits and changes may be thus briefly described. The mature flies (3 and 5) may be found among the strawberry plants late in April or early in May. In color they are a deep black, with two rows of large white or light spots on the abdomen. The female (5) deposits her eggs with a peculiar saw-like instrument, which is used to make the incision. The orifice through which the eggs are introduced is scarcely visible to the naked eye, but by splitting the diseased stem, the inclosed eggs are readily seen. These eggs hatch in from two to three weeks, according to temperature, and during the last of May and early portion of June the worms do much damage to the vines, by eating small holes on the leaves, as at 6. In color they are of a dirty or light yellow, and as they increase in age and maturity, become a light green. When full grown, they are about three quarters of an inch long, (4 and 6,) soon pass from the plant into the ground, where they inclose themselves in cocoons, (7,) and pass through the pupa stage, ready to produce a second generation of moths late in June or early in July.



This course of egg laying and hatching is again repeated, and a second set of cocoons is formed on the earth early in August, and in this pupa state the insect passes the winter, ready to emerge in the moth form in April, to again commence its ravages.

Snowy Tree Cricket.—*Œcanthus Niveus.*

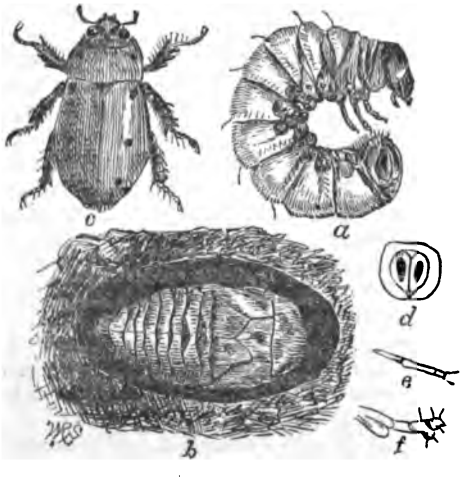




A Chester county correspondent complains of much loss to his raspberry plants by breaking off. The plant is much weakened by insect injury at the point of fracture, as was shown by specimen sent. The injury is caused by the deposit of of the eggs of the snowy tree cricket, which, while it seems to prefer the stalks of the raspberry or other pithy plants, will also deposit its eggs in willow, peach, and grape twigs. It is thus described by Harris:

"The male is ivory-white, with the upper side of the first joint of the antennæ and the head between the eyes of an ocher color; there is a minute black dot on the under side of the first and second joints of the antenæ, and in some individuals the extremities of the feet and the under sides of the hindmost thighs are ocher color. The body is almost half an inch long, exclusive of the wing covers. The female is usually rather longer, but the wing covers are much narrower than those of the male, and there is a vast diversity of coloring in this sex, the body being sometimes almost white or pale greenish-yellow, dusky and blackish beneath. There are three dusky stripes on the head or thorax and the legs, antenæ and piercers are more or less dusky or blackish. The wing covers and wings are yellowish white, sometimes with a tinge of green, and the wings rather longer than the covers.

Grape Beetle.—*Pelidnota punctata.*—Linn.



The complaints of the ravages of this beetle, which come to us from all portions of the State, indicate that it is annual in its visits, and is in fact well known where the grape vine grows. In our representation *a* shows the larva, *b* the pupa encased in its cocoon of decayed wood, *c* the mature beetle, and *d* the peculiar heart-shaped swelling near the rear end, which distinguishes the larva from the common white grub. Hand picking is the only remedy, but fortunately is not difficult of application.

The Potato Stalk-Borer.—*Gortyna Nitela.*

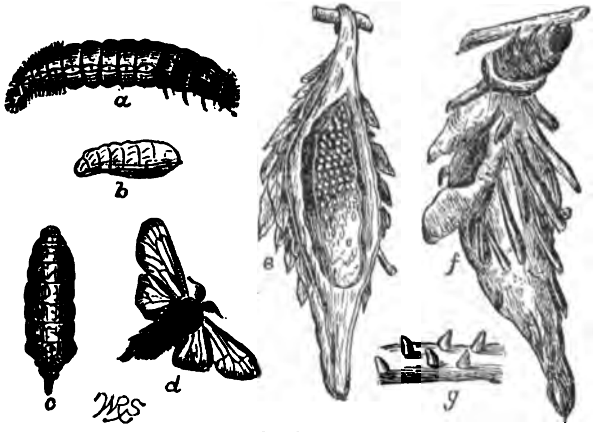
Complaints of ravages of this pest and the next one in our list, come with specimens from Chester county, where much damage seems to have been done by the combined work of both borer and weevil. In our illustration for the *American Agriculturalist* we show both moth and larva. The moth is of a mouse grey color, the front wings being of a pale yellow, with a curved line across each front wing near its outer end. The theory of propagation is that larva leaves the stalks some time in July, and passing into the ground near the roots of the plant at sometime in September, forms a chrysalis. It is supposed that the insect passes the winter in a state of torpidity, from which it arouses in May, and lays its eggs in the plant.

The plants attacked wither as if scorched by the hot sun, and in some cases great local damage is done, not only to potato vines, but also to tomato and egg plants, as well as to dahlias and other flowers.

The Bag Worm.—*Thyridopteryx ephemeraeformis.*

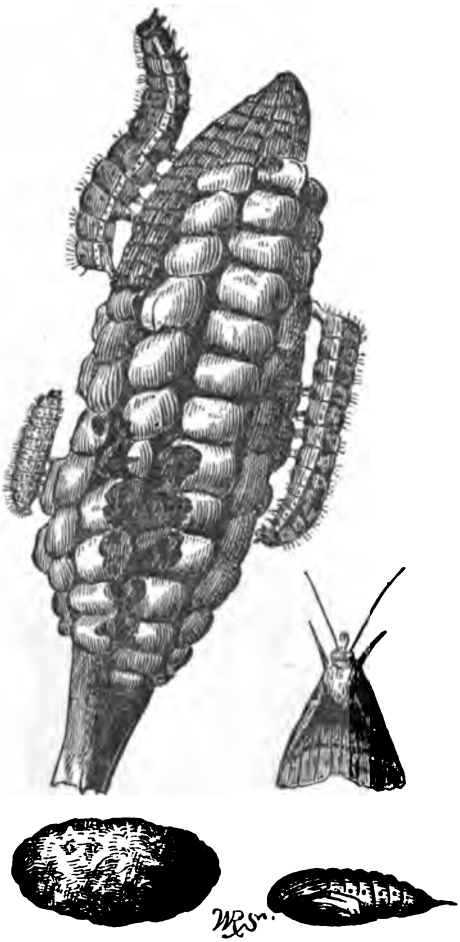
In addition to the specimens of this pest sent to the entomologist of the board, (see Report, page 52,) a correspondent complains of their large number upon an arbor vitæ hedge. The *American Agriculturist* thus describes this insect and its habits:

The bags of the bag worm are most conspicuous in the winter, when the foliage is not upon the trees. Many of these bags are empty, while others contain a number of soft, yellow eggs. The empty bags are of the male insects, those with eggs were made by the females. A female bag is shown at *e*, with the cluster of eggs in the center. The eggs hatch in early summer, and produce brown worms, which at once surround themselves with a covering, or " bag " as it is termed, as at *g*. As the worms grow, the bags grow heavy and hang downward. When full-grown, they have the size, position, and general appearance as shown at *f*. Should the worm be pulled from its casement, it would appear as at *a*, the protected part of the body being reddish and soft, while the exposed portion is hard and dark-colored. The worms close their bags and stop feeding for a few days, at four different times, for the purpose of casting their skins. At the close of the feeding season they fasten their bags to twigs by a strong silken band, afterwards cover the interior with soft silk, turn with their heads towards the lower end, and become chrysalids. The form of the insect in this inactive state is shown at *b*. Three weeks after the skin of the



male chrysalis breaks, and the moth, *d*, escapes. The female, *c*, has no wings, and never leaves the shell until after depositing her eggs, when she drops exhausted to the ground. The bag worm feeds upon many evergreen and deciduous trees. It is particularly fond of the arbor vitæ, and many complaints have come from its destructive work upon hedges of this evergreen. From a knowledge of the habits of this insect, it is obvious that by picking off and burning the bags in winter the pest can be destroyed.

The Corn Worm.—*Heliothis armigera.*

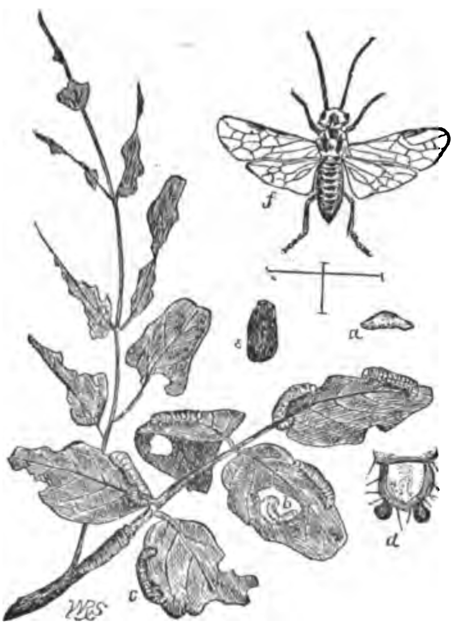


An Erie county correspondent sends specimens of this pest which, there as elsewhere, does much damage to sweet corn planted for the production of boiling ears. This pest, which is identical with the "bole worm" of the southern cotton-fields, does not confine her attacks to corn, but will attack most kinds of vegetables, and, in some localities, is very injurious to tomato plants. It is also claimed that it will, in the absence of other food, attack tobacco plants.

The full-grown moth places her eggs upon the uncovered silk of the ear, and as soon as hot weather arrives burrows in the ear, sometimes following a single row and at other times making a circle around the cob in a diagonal direction. During its transition from the egg to the pupa state, the larva presents many changes of color as well as form, varying from a very light green to a dark brown or almost black. During all of these variations the alternate dark and light stripes are preserved intact. The perfect worm leaves the ear, and, entering the earth near the base of the stalk, forms a cocoon of silk and earth, and goes into the pupa state, from which it emerges in three to four weeks a perfect moth, ready to propagate its species. During peculiar seasons, and in certain localities in each season, we have reports of much damage to the growing field crop by this pest. In such cases the loss is usually caused by the admission of water through the opening made by the escaping worm.

The Locust Saw-Fly.—*Nematus similaris*—NORTON.

A Lancaster county correspondent sends specimens of this pest to the locust grower, but confounds the damage done by it with that done by



the borer; the saw-fly only injures the tree by depriving it of the foliage, but is not necessarily responsible for the dead tops so much complained of. In the annexed plate we give, *a*, the egg; *b*, the young larva; *c*, the full-grown larva; *d*, the anal segment of the full-grown larva; *e*, the cocoon, and *f*, the full-grown insect. As indicated in the cut, the saw-fly is a small four-winged fly, with a body nearly or quite one fourth of an inch long, and wings expanding from three eighths to one half inch, or even more; the head is spotted black, as also is the thorax and abdomen; the body is of a dirty straw color. The eggs are deposited in a semi-circular cut in the under side of the leaf, and are covered by drawing the cut edges of the leaf over them; at hatching the young larva is of a greenish white color, with a brown head, but as it becomes more fully mature the cold becomes more distinctly green, and the head of a deeper yellow.

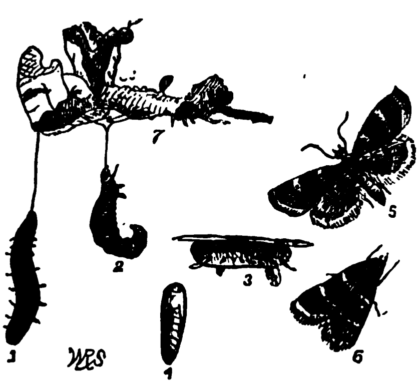
As in similar cases this damage is done by the larva, which grows to a length of about two thirds of an inch, and soon destroys all of the leaf but the mid or main rib. Prof. Comstock, of the United States Department of Agriculture, (from whose report our illustration is taken,) states that this pest will produce two if not three distinct broods in a season, the first from the loose cocoons in the ground, and that it is probable that the last brood of the season pass the winter on the cocoons in the ground.

Prof. Comstock, in his examination of this insect, has bred a parasite from it which lives upon larva, and furnishes a means of keeping it in check. No remedy except syringing with carbolic soap or paris green, can yet be given.

The Clover Worm.—*Asopia costalis.*—FABR.

This insect commences its depredations in the hay after it is stored in the barn or stack, and the damage done results more from the filthy condition in which it leaves the hay, than from any appreciable amount actually destroyed. By means of its web it fastens the stalks and leaves together in small bunches, which are more or less mixed with excrements.

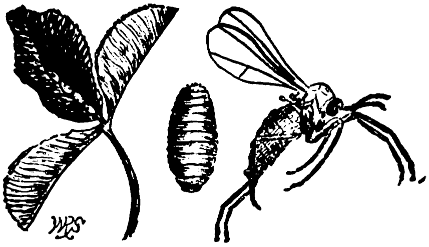
In our representation, 1 and 2 represent the larva; 3, shows the cocoon; 4, the pupa; 5 and 6 the moth, and 7, the web attached to the stalk.



The Clover Leaf Midge.—*Cecedomyia trifolia.*—**Löw.**

This insect has been reported as found upon white clover on the grounds of the United States Department of Agriculture, at Washington. French thus sums up Prof. Comstock's report of its habits:

"About the middle of June the leaflets of white clover may be seen folded upwards and fastened together, something like a small pod. Inside of this will be found from one to twenty small pale orange-colored maggots, about six hundredths of an inch long. These little armies live on the leafy inclosures, appropriating the juices of the leaf, very much as the Hessian fly maggots, an allied species, do the juices of the stalks of wheat, and with the same effect on the plants. The insect appears in June, and perfects two broods."



In the annexed figure, the left hand shows the mode in which the leaves are folded, the right hand shows the insect which deposits the eggs, and the central figure exhibits the magnified larva.

THE RELATION OF THE SCHOOLS TO DOMESTIC ECONOMY.

By ALEX. M. GOW, *of Washington, Pa.*

Read at Autumn meeting.

You have before you a curious relic of the domestic economy of a century and a quarter ago. It is an embroidered linen valance or bed curtain, and is typical, not only as a production of domestic manufacture, but also of the æsthetic taste and culture of that period in this region. It is the handiwork of one of the speaker's maternal ancestors, and is treasured as a precious legacy illustrative of the times in which she lived. A brief comparison of the domestic economy of even less than a century ago with the present, both in the town and country, may not be uninteresting or unprofitable. Less than a century ago it was expected that every hand, even those of the children, should contribute to the production of the family living. Children were taught to work. It was not only a part of their education, but it was required as a means of livelihood. Money was comparatively scarce, and it was not then so much of a necessity as it is at present. The farmer relied upon the ingenuity, skill, and frugality of the family for its support. While he cleared the land and made the crop, the good wife made the yeast and prepared the loaf; she raised the poultry, picked the feathers, and stuffed the bed-tick. The farmer raised the flax; but the wife spun the thread, wove the fabric, bleached the cloth, and cut it into the clothing for the person and the bed. She carded the wool, spun the yarn, dyed it with indigo or butternuts, wove the cloth, and fitted the garment. The farmer raised the beef and pork, while the wife rendered the lard and dipped the candles from the tallow for the winter's light. She leached the lye, made the soap, and washed the family clothing. Her hands milked the cows, and made the butter and the cheese. The table was spread, for the most part, with the products of the farm. Food, clothing, fuel, light were all prepared at home. Every hand had to contribute something to the general welfare. It was under the discipline of such necessity that families in this region were reared and trained for usefulness. The necessity for physical labor precluded the opportunity for much intellectual cultivation. Of books there were comparatively few, and these, in addition to the Bible, were generally restricted to the doctrinal discussions of theology. There were no children's books, and but few newspapers. The schools were irregular, and the terms were short. The subjects of instruction were generally limited to those indicated in the apprentices indentures—" reading, writing, and ciphering as far as the rule of three."

A wonderful change has taken place in our civil, social, and economical relations. Our education is entirely different from what it was even half a century ago. We buy now what formerly the family made. The economic struggle now is to make money to purchase the necessaries of life. We buy our clothing almost entirely. It is cheaper to buy it than to make it. We no longer learn to knit. Knitting, except for fancy work, is almost a lost art. Nobody makes candles. Few make soap. Maple sugar has gone out of fashion.

Formerly the education deemed necessary for the youth of either sex was primarily to secure them a living. The girls' trade was house-wifery in all its multifarious departments, embracing the preparation of the food and the clothing of the family. The girl was taught to spin, to sew, to knit, to darn, to patch, to milk, to churn, to brew, to bake, to cook. The boys were taught a trade by apprentiship, by which they learned the mystery that enabled them to earn their living. Formerly the education of youth was largely carried on at home, and was made altogether practical. The school was comparatively a small factor in the education of either sex, but particularly of the girls. Then, the only avocations open to girls to earn money was the use of the needle, or in domestic service. Within fifty years a great change has taken place in this respect. Institutions of learning have opened their doors to the girls on equal terms with the boys, and the result is that women occupy positions as professors, lecturers, teachers. physicians, scientific nurses, lawyers, and editors. The introduction of machinery has changed the conditions of family life, and the enlargement of the schools and the lengthening of the school terms have afforded such an education that girls are fitted to perform much of the work that was formerly allotted to men. They are now employed as clerks, as saleswomen, and shop-keepers, as telegraphers, type-setters, and organists. With these changes in domestic life, there has been a growing change of sentiment in relation to the propriety of women's engaging in money-getting labor. Every day the idea is becoming more firmly rooted, that the woman has a right to employ her talents in whatever way may best suit her own convenience and comfort. All work is honorable that is necessary to promote the welfare of society, and any honorable work that a woman can do, she has a right to perform. Domestic education is not imparted now as it used to be, because there is less demand for its application. On the other hand, the education of the schools holds a higher place in public estimation than formerly, not only on account of the development of the intellectual faculties, but because it affords increased opportunities for making a living. All over the country, special schools have been organized for instruction in the science of teaching in agriculture and its correlative branches, in civil and mechanical engineering, in elocution, in music, and in the art of nursing and caring for the sick.

Since the above was written the writer has observed that under the caption "A New Profession for Women," the November *Century* has a paper on the important work of the Bellevue Hospital Training School for Nurses. This enterprise, which has not only been successful in itself, but has been the parent of the many similar schools in the larger American cities, originated in the mind of Miss Louisa Lee Schuyler, of New York, in 1871, being more remotely the outgrowth of the Sanitary Association, and of Miss Nightingale's labors in English hospitals. The demand for the services of the nurses graduated at the Bellevue school, is said to be largely in excess of the supply,—a fact which would indicate that the profession is fairly on its feet.

Some of these are adapted to the conditions of life of one or the other of the sexes, or of both, and all are valuable to society, as they open up and improve the avenues which lead, by honorable endeavor, to the attainment of a living.

The object of the public schools is to prepare the youth of the state for citizenship. One of the primary conditions of good citizenship is the ability to be helpful individually and collectively. The general diffusion of the sewing machine has, as has already been intimated, revolutionized the business of making clothing of all kinds, for both sexes. There is no article of dress that cannot be furnished ready-made, and in most cases cheaper and better than it can be made at home. This fact has taken away the incentive that used to compel mothers to instruct their daughters in the use of the needle. The employment of the needle has fallen into disuse and neglect. This ought not to be, for, with all the use of machinery, there never will be a time when the arts of darning a stocking, of sewing on a button, of repairing a rent, or of putting on a patch, will not add to the convenience and comfort of the individual and of the family. It is probable, with this end in view, that the school authorities of Boston, Massachusetts, authorized the introduction of sewing as a branch of instruction in the public schools.

The act of the Legislature enabling school-boards to employ teachers in this department, passed in 1876, is as follows:

"SECTION 1. Sewing shall be taught in any city or town in all the public schools in which the school committee of such city or town deem it expedient."

This act is the outgrowth of an experiment made by a lady of Boston in 1865 or 1866, who had requested that a class of the older girls in the Winthrop school might receive instruction in more advanced needle work at her expense, and for this purpose she agreed to send a dress-maker and a seamstress once a week, and to supply all the materials. The request was granted, and the result proved so satisfactory that, after a trial of several years, when the matter was no longer an experiment, the work was surrendered by the lady who had commenced it that the city might carry it on. Accordingly the scheme has enlarged until, as is shown by the report of the year 1881 from the committee on sewing, all the girls of the city schools receive instruction in needle work regularly from salaried teachers employed especially for the work. The report says: "The purpose of the committee on sewing has always been to make the instruction in needle work thoroughly practical and useful. Meaningless stitches, set in useless bits of cloth, have always been disapproved, and the children have been encouraged to begin as early as practicable on some useful garment, however simple. After the varieties of plain needle work are taught, attention is paid to mending, patching, darning, making button-holes, and especially to the nice fitting and finishing of work." As the result of the year's work, in forty schools, for the year 1880–81, seventy thousand two hundred and seventy-one separate pieces of work were prepared by the pupils, embracing aprons, curtains and towels, handkerchiefs, dresses, sacques, undergarments, &c. So successful is this schéme of instruction that the report says: "It would probably be difficult to-day to find any master of a girls' school, or any member of the board, who would be willing to remove sewing from the schools."

Thus, from all that can be gathered upon the subject, this effort at economic instruction seems to meet a public want, and the only suggestion we can offer is that for purposes of mending, darning, and sewing on buttons, there is no reason why boys should not be included in the benefit. If this effort to teach helpfulness has proved a success in economic Boston, why may it not be equally beneficial elsewhere, wherever the conditions of social and domestic economy are found to be similar?

Efforts are making to introduce the culture of silk into this country, and they will probably be attended with success, but it will require a long time for the necessary knowledge of the subject to be disseminated. This is women's work. It is light, requiring only close attention, neatness, cleanliness, and care. We see no good reason why in every summer's school the children, boys and girls, might not receive valuable practical instruction for six weeks in the feeding and care of a few silk-worms, and that without any detriment to their other school-work. Aside from any economic advantage, such instruction in the metamorphosis of insect life would be invaluable. Such a study would quicken their perceptive powers, would stimulate habits of observation, would develop human ideas of beauty and of design that would be of the greatest advantage. In a given district, where the common mulberry or the osage orange is found, such an experiment might be made to impart a practical knowledge of silk-worm culture that, aside from its educational influence, would be of great economic advantage. An ingenious teacher, backed by an intelligent and appreciative school-board, might thus introduce the practical study of entomology, and, at the same time, develop a taste and impart a desire, that might result in the introduction of a new department of industry.

In the State of Iowa, and, possibly, in some of the other western States, the schools are encouraged to compete for prizes at the agricultural fairs. These prizes are awarded for the best specimens of penmanship, drawing, the best solutions of problems, and other school work that may be made capable of competition. Why should not the same stimulus be applied to the teachers and schools in Pennsylvania? Why should not the children be trained by such competition to be industrious, enterprising, and useful? Domestic economy might be greatly promoted if specimens of letter writing, of book-keeping, patching, sewing, darning, or cocoons could be shown as the result of judicious instruction. Such competition would improve the teachers and stimulate the pupils.

The subject is capable of great enlargement, but, possibly, enough has been said to direct the attention of teachers, school-officers, and the school-loving public to the feasibility of promoting the relation of the schools to the study and practice of domestic economy according to the necessities of our day.

A BETTER LIFE FOR THE FARMER.

By BOYD CRUMRINE, Esq., *of Washington, Pa.*

Read at the Autumn Meeting of the Board.

I can easily believe that there may have been some misapprehension as to the meaning of the title opposite my name upon your programme, and that some may have supposed you were to receive a brief lecture upon that happier locality to which all good farmers are to go when this life's fitful fever is over; but I promise you that in what I shall say I shall deal altogether with the more practical things of this world, leaving those of the world beyond to those spiritual teachers, in whom more confidence would be placed. The subject chosen will, perhaps, appear to have an intimate connection with the general subject of your deliberations.

It has often occurred to me that one important matter has been omitted from the discussions and deliberations of agricultural boards and societies, and that is, the necessity for an improvement in the home-life of the farmer, and the methods by which that improvement may be obtained. Literature, in the shape of agricultural reports, sent out by the obliging congressmen, solicitous as to the enlightened welfare of his constituents, or in the shape of well-turned addresses delivered on fair-days, by eloquent gentlemen ambitious alike to air their knowledge upon the question whether wheat is better sown broadcast or drilled in, and kindred subjects, as also to stand on the warm side of the horny-handed sons of toil. Such literature and such addresses reach my eyes and ears less often than with many of you, but I believe I have never yet seen or heard of an attempt to point out how there ought to be and how there might be a better and happier way of living for the farmer and his family. Is such a subject unworthy of consideration among agriculturists? If not, then what I shall say briefly may serve as hints for the use of those whose opportunities to enlarge upon them may be better than mine.

The logic of it is this: God has made all his people with a capacity for the highest enjoyment. Is there not within us all that which enables us to love to live? Are there not time when life itself is a luxury? Take some of our bright October days, when beneath a sun-light golden and glorious there lies a world of maturity, a ripened growth of forest and of field, the very air burdened with the rustling of the fallen leaf, and with it nothing of languor, but everything of fullness and ripeness and content; when the harvest is all gathered and another seed-time is just ended; when the hot noon-day of summer is passed, and the sun-set of the year has come, is there any one who sometimes at least cannot feel that God is good to let him but live to give him that health of body and mind which enables him to feel that life itself is a blessing? Well, just as sure is it in my mind, that, as the instinctive dissatisfaction with all that this life can give us is itself an evidence that the soul is immortal, so is our capacity to enjoy life and living an evidence that God intends us to be happy here and now. Is austerity and religion necessarily inseparable? May not he who loves the world and enjoys it, the better love the good God who made it for him? Why then hesitate to say that the highest culture is that which leads to a pure, contented, and happy home-life?

What then of the life of the farmer?

His life is a life of toil. He is the producer. All others are consumers. His corn, his wheat, feed the world; his wool and his cotton clothe it. The manufacturer only changes his wheat into flour and his cotton and wool into bales of cloth. The manufacturer who makes these changes toils, too; he may worry more; but is his life the same? His surroundings generally evince more comfort and a more attractive home-life. But as the occupation of the farmer is at the basis of all other industries, as by the sweat of his brow, is produced, that which supports and clothes all that are engaged in other enterprises, so is he, and so should he be entitled, not only to all the independence in his way of life he now enjoys, but more than that, so should his home-life be the most peaceful, the most comfortable this world can afford. But is it?

There is no need of detailing the opportunities and advantages with which our farmers are favored over those of the agricultural communities of any foreign nation; their advantages in the way of almost a virgin soil, in the way of a splendid climate, facilities for market, educational advantages, the extent and cheapness of our acreage, with a minimum of taxation towards the maintenance of free institutions which our farmer loves and of which he is proud. But that these opportunities and advantages may be recalled to mind, let us only glance at some of the surroundings in the farm life of the thickly settled parts of the old world.

In 1878, Phœbe Earle Gibbons, a literary lady of Eastern Pennsylvania, traveled in France and Belgium, and to know how the masses of the people lived, she did the wise thing, lived with them. Her home was made for a sufficient length of time with those who made up the great middle class, the artisans and farmers. Her observations are recorded in her book called "The French and Belgians," published in 1879, by J. B. Lippincott & Co.

In the south of France she made her home for a time with a family owning one farm of about one hundred acres, beside other property. I shall quote her words here and there. "In the little wood-shed," she says, describing the surroundings of the farm-house, "I see lying bundles of bark tied up to sell,—bark from small branches,—for such things are scarce in France." * * * "Every third or fourth year all the trees in France that do not bear fruit are cut, their branches being trimmed, and sometimes the top taken off, too. This is done in August or September. They throw the brush down at the wood-pile, and feed the goat, and sometimes the sheep, with the leaves during the winter." "Cows are passing along the road, and I observe a young girl with a basket and shovel collecting the droppings. One of my young companions think they are to be put to the vines."

The lady visits the north of France. There she stops at a farm-house where the family own a house and lot and twelve acres of farm land. In that section of the country the land was all under cultivation, no pasture land. And it was valued at six hundred dollars per acre. "They keep no hired people," she says, speaking of the family in which she stopped. "At breakfast bread is broken up in the coffee of each person but myself. There is a piece of butter, and some bits of sugar upon a piece of paper before me. I do not see the others take any butter." "The two strangest things in the yard are two troughs dug in the ground, one of them about two yards long and one and a half wide, and nearly a yard deep. These holes are for pulp. * * * Just outside the village there is a raperie, or place where our beets are pressed. We sell them there to a company that has obtained the right to manufacture sugar. * * * When we take our beets to be weighed we can buy the pulp left in pressing * * * at about two dollars for two thousand two hundred pounds (one ton,) and we bought one hundred francs (twenty dollars) worth, and put it into these holes to keep and feed." * * * "Mr. Cireau, (the mayor of the Commune,) tells me that all the woods here are planted, and that the proprietor himself cannot cut them down without government permission. He can trim them and lop off the branches, but not root them out, the mayor says." * * * "In renting lands here there is a peculiar bonus given, called the pot of wine, or *pot de vin*, the custom being probably ancient. Lands are always rented for nine years. Madame Druvet rented hers for about twelve dollars the acre yearly. The *pot de vin*, (or bonus,) which she receives, is another twelve dollars on each acre paid once in these nine years. For some extra lands an extra *pot de vin* is bid, amounting even as high as seventeen dollars the acre. Mr. Cireau, the mayor, rented his thus, (there were nearly one hundred acres:) for eighteen years, at about sixteen dollars the acre, and the *pot de vin* sixteen dollars more; therefore, the first year's rent is double, or thirty-two dollars per acre. * * * And those who hire these lands also have to pay the taxes, which amount to one and a half dollars per acre." Here is an average rental of near twenty dollars per acre! Further along we are told that the harvest hands earns a bushel of wheat in four days labor, and boards himself at that!

In Belgium, the writer states, "land here without buildings is worth about five hundred and thirty dollars an acre, and, when there is competition, may run up higher than seven hundred. Farmers here rent for money; the rent payable every six months, and amounting to about ten dollars the acre. The use of the buildings is thrown in, and the farmer pays all the taxes. The taxes amount to seven per cent. of the revenue; the government making an estimate once in ten years of the value of the property, (income,) and putting the taxes at seven per cent."

These extracts are quoted here merely to give a hint of the differences in the wordly circumstances of the farmers of our own country and of those of the Old World. And the statements, though astounding, are trustworthy. They show the necessity for the farmer's family in the old country to abstain from butter, to use twigs for fire-wood, leaves for fodder, and beet-pulp for feed for his cattle, and to gather the droppings from the street for manure. Yet withal, the French are a happy people.

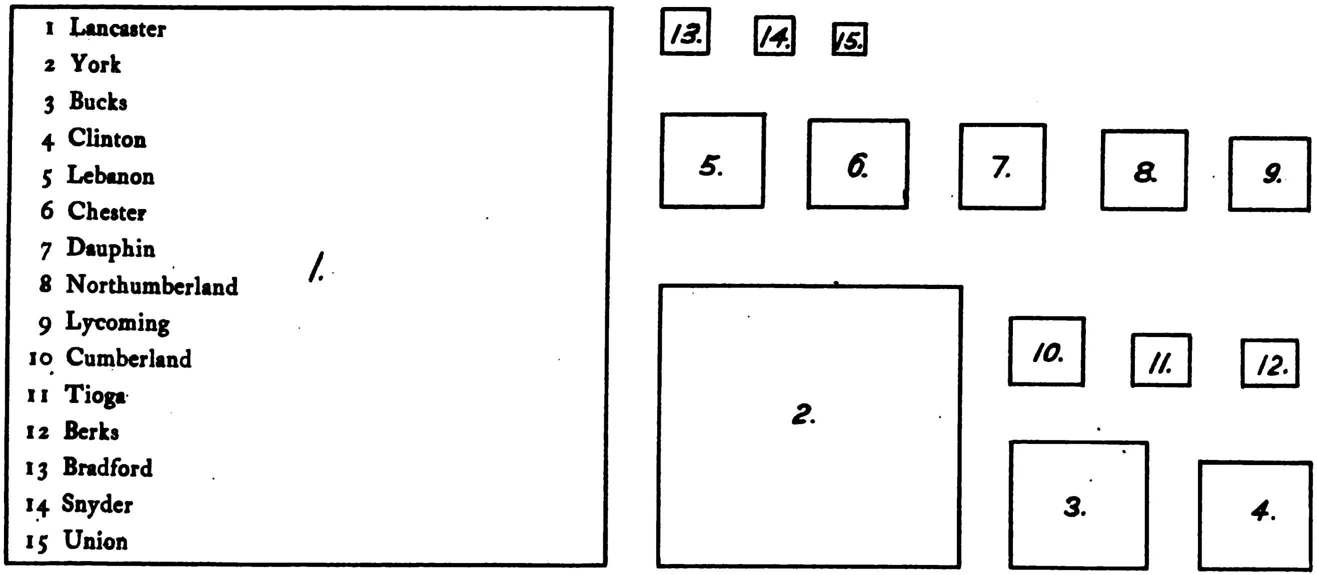
I have not adverted to the density of the population of the Old World; to the fact that in the Department of the North, visited by the authoress referred to, the census of 1876 showed a population of six hundred and ninety-two to the square mile, whereas in Pennsylvania, in 1870, we had but about seventy-six. There the lands are chiefly owned in large tracts by those who do not live upon them or near them, and who, doubtless, fix the rental only as limited by their own extravagant wants and the starving point of the tenantry. Of all these things there is one result, a density of ignorance measured by from twenty-five to thirty-five per cent. of those over ten years of age who cannot read and write; a ratio measured in Pennsylvania by but about four per cent. And yet, withal, the Frenchman is said to be happy in his home life.

Wherein, with all the advantages in his favor, does the Pennsylvania farmer, who owns the land he toils upon, who is almost free from burdensome taxation, with countless liabilities on all sides for the improvement of his condition—wherein does he fail in what he owes to himself, and wherein may there be a remedy? Must it not be admitted by all who consider the subject that he fails in providing the essentials of the highest happiness in the family circle?

I shall not intrude too far within that charmed circle to point out de-

PENNSYLVANIA CROPS. XIII.

Tobacco Crop of 1880 by Counties.



ficiencies which it would be unpleasant to recall. A hint or two will draw attention to them. And remember, I refer only to the average farm-house, for there are many bright homes which need to be seen only to be admired, while there are others so sad that the world should not see that sadness. But drive along the highway, and look at the average farm-house. Surely, as that is where the family dwells that tills the hundred acres lying about it,—as that is where the nest is built in which is gathered the brood that is to be taught to take the places of the old ones when they are gone,—surely it should be the brightest and most attractive spot of all the broad domain. But is it? Generally the barn is the better dwelling, and the sheep-house is of equal comfort. In the summer when the fields are green with the growing corn or yellow with the golden grain, unsightly weeds waist high conceal the path to the entrance door, and almost shade the windows from sunlight. There may be about a garden, perhaps, fence enough to protect it from the stock, but as for something which will draw a boundary between the place where the family live, and rest and sleep, and that in which the stock may graze at will,—if there be such a division fence, very often it is dangerous to its safety to approach it. At the back door there is usually a small lake, but it is neither pleasant to see nor desirable to be near it. Enter. There is not a book to be found, perhaps, but the family Bible ann hymnal; there may be an organ, but the music-master has not been abroad. Yet, here and there are sons and daughters to grow into men and women, and in that growth, like plant-life, craving for life-stimulus, and wilting when it is not had. And winter comes. Then, when this family nest should be so bright and sweet. as everything is so cold and harsh on the outside, there is very often but one fire, and that is in the cooking-stove or behind it; no lights or poor ones, and the boys and girls are hustled off with the old folks as soon as the supper dishes are put away, to cold and cheerless rooms, where they are kept from freezing only by the immense feather-beds provided by their thoughtful mothers. And why,—the evenings when the day's work is done, being the time when the family circle is complete, the time for social and intellectual improvement, the time when jokes and nuts are cracked, the time when other girls can come to see the sisters, and to let the boys take them home again, the time when, if the girls don't come the boys might want to read and study, if they have had an opportunity to learn to love to read and study, and we know that intellectual enjoyment is the highest earthly pleasure vouchsafed to man,—why do farmers insist upon the perpetuation of that foolish habit of driving all the folks off to bed almost as soon as it is dark, summer and winter, just to pull them out again long before daylight in the morning? Is it solely because the day's labor has been so wearisome? Is it not that there is so little of life and home-comfort that the evenings soon are lonesome? This is a fine method of cultivating and improving superlative dullness. It is a splendid way to inculcate the notion in the boys that a farmer's life is the life of a slave, and in the girls the inclination never to marry the farmer's son, but rather the other smart youth, who has run from the dullness of farm-life and become a fourth-rate doctor, lawyer, or preacher, without the intellectual training to make him respectable in either calling he may have chosen. It is a fine way to make the children discontented with home, to destroy home-life itself.

Remember I am only giving hints of some of the faults of the average home-life of the farmer. I do not point out all, nor do I dwell upon any, of those faults. But do they not exist? It may be unpopular to refer to them, but if they exist, is it not the duty of those who discuss agricultural subjects to recognize them and provide a remedy?

It is not hard to change this condition of things. A century of our growth as a people has passed. We are free; and being free, if the pauper-enforcing civilization of Europe is ever to exist among us, it will be self-imposed. Our forefathers had to conquer a wilderness, and to live in cabins while they were doing it. That wilderness now blossoms as the rose, but the proper condition of home-life has not been reached. It is now time it was.

The average farmer has a fine productive tract of land, in a fine climate. He can produce with the labor of his own hands almost all his necessities require. He is not burdened by excessive taxation to support a non-laboring aristocracy. Why should not the choicest spot be made the place of his home, and all adornment within and without made use of to make that home a joy to look upon, and a place worthy of the guardianship of angels, for in it are to be nursed and trained children who are to make the men and women of the masses of the earth?

Good old Sir Henry Wotton, the architect, writing three centuries ago, says: "Every man's proper mansion-house and home, being the theater of his hospitality, the seat of self-fruition, the comfortable part of his own life, the noblest of his son's inheritance; a kind of private princedom, nay, to the possessors thereof an epitome of the whole world, may well deserve by these attributes, according to the degree of the master, to be decently and delightfully adorned."

Yes; decently and delightfully adorned. Tell the farmer, then, to pick out a spot by the spring beneath the shadow of the old oak tree, fence it off by a neat and substantial enclosure, so that nothing that hath not the silver-tongue of communicative speech can enter, except the invisible spirits of peace, and they have wings and can fly over. Let him build his house himself as he wants it; but with some one who knows how to aid his wife in contriving for all the places to put things, and let it stand where the sunlight may fall over it and into it, except in the heat of the day, and let it not be devoid of beauty, but be "decently and delightfully adorned." Then tap that spring on the hillside, or plant a wind-mill by the stone bank at the foot of the oak tree, and send good, fresh water into every room. Then plant the Virginia creeper at the gable ends of the house, and climbing roses by the veranda pillars in front. Then keep the lawn all round the house—in front, at the sides, and at the rear to the vegetable garden—clean-shaven by a weekly application of a few minutes of time, so that the good wife and the girls will not need to wear men's boots and to tuck their skirts beneath their elbows when they go to the milking or to take the washing from the green. It is folly to say farmers are too busy or too tired to do all this. When once it has been begun, the enjoyment afforded will make the work easy, and it will then be discovered what little extra work it requires. Plant a few trees in the lawn from the forest and along the roadside, making a lane of shade for your neighbors to enjoy when they pass through your land. On the day of the birth of your son plant a hickory, that fifty years hence your grandchildren, cracking nuts beneath it, may be told that you did it in honor of their father's coming, which will incite them to do likewise for their grandchildren, and thus bind together the future with the past in one brotherhood of kind thoughtfulness. It is astonishing what power mere sentiment has in this world.*

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* How great was the foresight of the founder of Pennsylvania! In the "conditions, or concessions agreed upon by William Penn, proprietary and Governor of the Province of Pennsylvania, and those who are the adventurers and purchasers in the same province," dated the 11th of July, 1681, it is provided:

"XVIII. That, in clearing the ground, care be taken to leave one acre of trees for every five acres cleared, especially to preserve oak and mulberries, for silk and shipping." See 2 Proud, App. I, p. 4.

Put books into the house; the best friends man ever had. You may crowd them together from cellar to garret. different kinds of books, sorrowful books, gay books, Shakspeare, philosophy, fiction, prose, poetry, and they never quarrel or say ill things of each other. There need not be many books; there may not be many readers; but O! the immense amount of comfort that may be found in them. Says the wise man, Emerson, about books:

"Consider what you have in the smallest chosen library. A company of the wisest and wittiest men that could be picked out of all civilized countries, in a thousand years, have set in their best order the results of their learning and wisdom. The men themselves were hid and inaccessible, solitary, impatient of interruptions, fenced by etiquet; but the thought which they did not uncover to their bosom friend is here written out in transparent words to us, thè strangers of another age."

And a taste for reading is a thing which is like the shield held over one by an all-powerful arm to keep from harm. Who fears for the country boy that is fond of books? Ah, but it will make him lazy. Not so; if he have a sound body, well able to work, he will work the better and to a better purpose. But, you again say, the boys have no taste for reading and study. Cultivate what they have. Give them a chance. Try an experiment; if they will take to nothing better give them "Mike Fink, the Last of the Keel-boatman;" even such trash has sometimes started intellectual activity into life.

And music; a word about music. For the sake of the sweetest influences in favor of the harmony of the household do not omit to recognize the power of the harmony of sounds. While I do not think that all may be made even tolerable musicians, yet in every household there may be one. Just as there are no two forms alike, no two faces alike, so there are no two souls alike; some are strong and rough in nature, fitted for hard knocks; others gentle and quiet, in sympathy only with that which is gentle and kind. These last are they who may have most power to lead and inspire, where the more rugged natures serve a different end. And is there not by every fireside one such, who, with instinctive art, is the inspiration of the household, and whose very gentleness is a tower of strength? Happy, then, is the family circle which has within it even one who can bring gladness, drive away full care, and throw over all beneath the roof-tree the enchantment of the melodies of vocal or instrumental delight.

These, my friends, are some of the suggestions to be made for the improvement of the home-life of the farmer. Again, I ask, is not an improvement needed? And are these suggestions impracticable? True, this is the time of year when the katy-did

"Says such a very foolish thing,
In such a very solemn way;"

and it requires a little courage to avoid a fear that these ideas may be treated as too absurd for consideration. But I plead for the farmer's wife, whose work is said never to be done, that her life may have more of sunshine in it.

"The poet's laurel wreath she doth not wear,
Since in her busy life she seldom writes
The poems that she lives; yet on the heights
With native sympathy her soul doth share
The poet's keen delights.

"She neither seeks nor gains the world's acclaims,
Though rarest gifts are hers of mind and face;
More proud is she to fill her simple place,
And wear what seem to her the dearest names
That womanhood can grace.

"Her joy is to guard her loved from pain,
To take from them the burdens hard to bear;
To give her days, her nights, her life, to care
For those who loving her, yet entertain
Their angel unawares.

"And more than artist's patience she doth give
To tasks of motherhood, since not alone
High dreams are clothed in color, form, or tone;
Wrought from the lives that human beings live
In highest beauty known.

"On such as she the world may not bestow
Its vain applause; far from all vulgar strife
She dwells content, if throug her hidden life
Her loved the meaning of the name shall know,
Of mother and of wife."

I plead, too, for the farmer's son, that he may feel that though he pass the whole world over there is to him no place like the home of his childhood. I plead for such home surroundings and happiness as are opposed in their influence to the wild unrest so common to American youth. As it is now, as soon as the farmer's son nears his majority he feels drawn away to the city or town, and it would be fearful to point out how many wrecks are made. Do what can be done to keep the boys at home. And I plead for the farmer's daughter. Let her have a bright, cheerful home-life: she will convert comforts into elegances; under her hands, flowers will bloom where only offensive weeds now grow, content will take the place of inquietude, and her life, perhaps, otherwise sad and foreboding, and open to temptation, will become a never-failing source of strength and joy. Such sons and daughters,—blessed with healthy bodies and minds, through every fiber of their being imbued with a self-respect, a self-consciousness of well doing, which only such a home-life can give,—they alone are fitted to survive in the struggle for existence, and to conquer in the battles of the future.

True, these home comforts will cost a little labor and a little money. But money not thus spent may prove a curse to those who inherit it. After all, it is only the mean and narrow-minded who respect a man the more he has saved from the happiness of his family. The Lord thinks but little of money; see the kind of people who are allowed to have the most of it! Wealth, honorably acquired, is honorably enjoyed only when it is made the means of comfort, and of a broad and enlightened culture. And the people who toil on the uplands and in the valleys, give character and tone to the whole land; let there be, then, a better life for the farmer.

THE COMMON LAW AND STATUTES OF PENNSYLVANIA REGULATING SURFACE AND UNDERGROUND WATER-COURSES BETWEEN LAND OWNERS.

By ROBERT McCALMONT, *of Franklin, Pa.*

Read at the annual meeting, 1882.

The law of water-courses is not so abstruse that its principles cannot be reduced to a few sentences; and it will be our endeavor to condense and simplify the subject as much as is possible.

Streams are of two sorts:

I. *Navigable*, or such as are open to navigation, either by custom or by statute. The land overflowed by these, in all stages of water, belongs to the State. subject to certain rights of the owners of the banks.

II. *Unnavigable*, which are not open to navigation. The land overflowed by these belongs to the owners of the banks; the owner of each side owning to the middle thread of the stream.

The *rights* a man has in *unnavigable* streams, flowing through his own ground, are:

First, to use the water or divert its channel on his own land, provided he return the same with imperceptibly diminished volume, and of the same purity as when appropriated, at the place of the stream's original departure from his property.

The amount of water that may be consumed is guaged by the size of the stream from which it is taken. Thus, in the case of a creek or small river, one may take an almost unlimited amount, provided he do not materially lessen the amount of flow, while in a very small creek or run, he is sometimes prevented from taking enough to supply his necessary requirements.

It has been laid down as law that "a man may use the water for the purpose of watering his meadows, provided he so construct his races, or the ground is so situated, that any surplus will return again to the natural channel, before it reaches the occupant below him, and provided the flow of water which the occupant below was previously entitled to the use of, is not materially diminished; where he goes beyond this, even for watering his meadows, he subjects himself to a suit for damages, although the damages may be small; whether a stream is materially diminished, so as to subject the occupier who diminished it to damages, must, in some measure, depend on the capacity of the stream; when a stream is so large as to come under the denomination of a creek or river, a large quantity may be used for irrigating land without any appreciable diminution of the quantity, and no one injured, or have a cause of action against the person lessening the quantity. But where the stream is so small that the quantity taken for irrigation perceptibly and materially diminishes it, the person affected by it will have a cause of action, and the question does not turn on whether the occupier below, who complains, has sufficient water left for his domestic purpose, or more than he was previously using from the stream, but whether the quantity flowing on his land, which he had a right to use, has been materially lessened or diminished."

What has been said, in the above-quoted article, in regard to the use of water for agriculture, will apply, with equal force, to the employment of water in connection with any business, for any use.

The reason of this rule is obvious. If one man can diminish a stream perceptibly, as it runs through his land, every one, through whose land the stream passes, would have the same right; and if every one would exert his right to the utmost, the stream must soon disappear, to the wronging of some still lower riparian owner. Besides this, stopping the use of water before the stream is perceptibly diminished, is the only certain rule which would insure *all* riparian owners the greatest possible rights.

Second. The use of all the natural water-fall or power in his land. That is, he can build a dam at the lower boundary of his property, and back the water to his upper line without injuring any person. But if he back it beyond that line he is a trespasser. Where there are different owners on opposite sides of a stream, each has an equal right to the power, for the proprietorship of the land extends to the middle thread of the stream, which must mean the middle of the channel, as that is the middle thread at low water.

Under some circumstances, as at extremely low water, a mill-owner may use all the water, if he has been accostumed to use an equal quantity at ordinary stages of water without injuring the holders below him, and he may, under similar circumstances, retain or prevent the flow of water for several days, in order to have enough to carry on his business.

The same rules apply to springs, if the stream therefrom flows over the land of another who does or could make use of it.

The rights that may be *acquired* in unnavigable streams, are such rights as belong to some other land owner, and can be vested in another only by a grant, either express or implied. An *express* grant is one openly avowed or uttered, that is, expressly made. An *implied* grant is one which the law supposes to have been made from the land owner's allowing another and near land owner to enjoy, openly and adversely, some or all of his rights for a period of twenty-one years.

These acquired rights are called *easements*, which, as will be gathered from what has been said, are defined to be:

"All the privileges which the public or the owner of neighboring lands hath in the lands of another."

It would be impossible to mention of what easements one may be possessed, even in regard to water, but it will be safe to say that any trespass on the rights of any higher or lower riparian proprietor, which has been continually and openly repeated during a period of twenty years without objection on the part of such land owner, becomes a *right* in the trespasser, the exercise of which cannot be denied him, provided, of course, such acts are not harmful to the public good.

Thus, if a person has an easement in a spring, which entitles him to take all the water he may use about his household, he may, in dry seasons, take all the water the spring produces, to the detriment of the owner of the spring, who may depend for his own supplies upon the same source, without being liable to restraint or damages. For although this is an injury to the spring owner, it is in law considered to be an injury without wrong, "a wrong done a man for which the law provides no remedy."

In navigable streams, the land confined between the low-water marks belongs absolutely to the State. This may be granted out by the State to private persons or corporations for the purpose of mining, but the channel must remain free and unobstructed.

The land between low and high-water marks belongs to the State, subject to certain rights of the private adjoining property-holders. These rights are such as the right of way to the channel, and of building docks and wharves, &c.

The adjoining property-holders have the right also of building dams in all rivers, except the Delaware, Lehigh, and Schuylkill, for the purposes of securing "*water-power*" for "mills and other manufactories," and to lead off enough water from the main stream to run the same, provided they do not interfere with navigation or the passage of fish, and do not injure or infringe upon the owner or owners of any private property upon or near the stream. But this right of building dams is for the purposes stated in this act, and where a man constructed a dam for the purpose of making a pond to be used for a floating place for logs, until needed in a saw-mill which he had erected near by it, it was judged to be a nuisance.

However, if the dam interferes with navigation or the passage of fish, upon complaint made to the court of quarter sessions, it shall appoint three commissioners, who, if upon examination of the facts, they conclude the complaint was well founded, a bill of indictment shall be sent by the court to the grand jury, and any persons so convicted. shall be liable to pay a fine not exceeding one hundred dollars, and the obstructions shall be leveled by the road commissioners. If any one suffers by reason of the navigation being impeded, he can recover a satisfaction in damages for the same, by an act passed March 29, 1871, declares: "When any person or persons have entered upon, or shall enter upon any creek, rivulet, run or stream, tributary to the West Branch of the Susquehanna river or any of its branches, the same not having been declared or become a public highway in its entire length, and shall have there erected upon their own lands or upon the lands of another, under written authority, any dam or dams, cribs, wharves, piers or channels, or shall have it cleared out or shall hereafter clear out, and improve the said stream for the purpose of floating lumber thereon, every such person or persons shall be deemed and taken to have therein a right of way, exclusive and personal, upon filing the security and recording the statement hereinafter required."

The security which is filed, is a bond for such sum, and with such sureties, "as shall be approved in writing, indorsed thereon" by the judge of the county courts," conditioned to pay all damages to property along said stream, by reason of the erection of these improvements and the navigation of said stream."

Moreover, such persons shall file in the recorder's office of the county in which the stream is, a statement, under oath, detailing the facts upon which the claim to such right of way is founded, with the date and character of the improvements made. Other persons desiring to take advantage of these improvements or to use the stream, must compensate the original erector or improver, or file bonds so to do, when the amount of compensation has been decided upon by assessors appointed by the court.

Property-holders along the stream so improved, shall have their damages determined also by assessors appointed by the court, and the improver must keep his dams, &c., in good repair, otherwise his exclusive right of way lapses or falls through.

In navigable streams any person can fish provided he commits no trespass upon the riparian owners, or does not interfere with an exclusive right of fishing granted, specially, by the State to individuals; but in unnavigable streams, the owner of the property has the right, exclusive of all others.

In underground water-courses the rules are the same as in regard to overland water-courses, if the stream flowing underground is well-defined; otherwise the law takes no notice of it. Thus, if a man's spring is fed by a well-defined and known underground water-course, it is a wrong to him if any person through whose land the stream may run, obstructs it or prevents or lessens the amount of flow to his spring; but where the supply stream is not known and well-defined, or where the spring derives its waters from percolations through the earth, any draining of the spring, by sinking wells, digging shafts, trenches, &c., or polluting its waters by similar or other means, provided they are not made use of for the purpose of ruining the spring, is a loss without injury to the spring owner.

Thus, we have endeavored, in a short manner, to give a clear view of the laws regulating water-courses, and, in doing this, we have carefully avoided what might, in any respect, be called a legal discussion of the question. For, as we intimated at the outset of this paper, we take it that a few examples of the fundamental principles which govern the rulings on the subject, are vastly more beneficial and instructive to any, except legal minds; for most persons are but confused by a profuse citation of precedents, which, until they are glanced into, and their verbiage, like a morning fog, is dispersed by the brilliant rays of some intellectual sun, appear only contradictory and opposed.

The above article was, for want of time on my part, prepared at my request by Robert S. McCalmont, of Franklin, Pa., son of the late General Alford McCalmont, a young man just admitted to the bar, but having far more than usual ability and acquirements. I fully indorse the position therein taken, and have nothing to add within the scope of the subject assigned me by the committee, but will add a brief discussion upon the law governing what might be termed *surface water*, which is different from that of regularly formed and running streams. By it is meant not only that which comes from the clouds, but oozing springs or swamps which makes its way diffused over the surface or through the mud until it is finally gathered into a running stream, when it is again subject to the law of the foregoing article. But so long as it remains diffused surface water, the owner of the land has a right to detain, dam up, or use any portion or the whole of it in any way he sees proper, or turn the whole of it upon his neighbor with impunity. So, also, let me here mention the road-master has a right to turn water upon your land at any necessary point to protect highways, even though it be into your best meadows, with the accompanying evil of dirt and gravel, andyou have no right to turn it back on to the highway or dam it up, or damn the road-master, though it must be admitted, in some cases, the temptation to do is very strong.

M. C. BEEBE.

DISCUSSION.

The subject being open for discussion:

Mr. NOBLE. There are one or two questions I would like to ask Mr. Beebe in connection with this: My understanding of his essay has led me to infer that no one has any right to hold water back so as to injure or prove detrimental to the interests of any person below on the same stream. Is that so? The reason I ask is this: On a stream in Bedford county, in which I reside, we have three or four grist-mills or flouring-mills, and above us and at the point where I reside we have a woolen factory. Those flouring-mills will draw up the boards on the dams and permit the water to run down at night, but in the morning after the boards are put in again, all water is held back except what runs over the dam, and the result is that the woolen factory sometimes has to stand two or three hours a day without doing anything. We have served notice during the summer to stop that, but we have never yet found it necessary to go into litigation. I do not know but this is about as good an opportunity as any other to get free advice upon the legal question.

There is another thing to which I desire to refer, and that is, the pollution of streams by saw-mills. We are bothered more in our county with a big paper-mill than anything else. They draw off their matter into the stream, destroying all the fish. The fish, perhaps, would thrive and do very well, but there is nothing for them to eat; and it has been a question with me whether that is permissible. However, the paper-mills are more valuable to us than the fish, so we have never sought to make any fuss about it.

Mr. BEEBE. I do not wish to make any specific application to a case in hand without a fee, nor do I want to give an opinion upon a specific case without knowing all the facts and circumstances. You have the principles governing the subject, I take it, in the essay I have just read.

Dr. ROLAND. What is meant by unnavigable streams?

Mr. **BEEBE.** Brooks, creeks, runs, in one sense, and in another, any water-course not made navigable by statute or custom.

Dr. **ROLAND.** What do you mean by the term, in the essay?

Mr. **BEEBE.** I have already stated, that streams are unnavigable by long custom, but of course they must be such streams as are unnavigable. The matter is almost determined by statute in Pennsylvania.

Mr. **MUSSELMAN.** There are a series of dams that almost dry up the stream below where I live, but if I understood the essay correctly, it is not legal for me to do with the water as I please in that brook. Did I understand correctly?

Mr. **BEEBE.** Is it a stream passing through another farm?

Mr. **MUSSELMAN.** Yes.

Mr. **BEEBE.** A well-defined brook?

Mr. **MUSSELMAN.** Well-defined. It is not navigable. Can I not do as I please with the water in that brook?

Mr. **BEEBE.** If you have followed the custom of taking as much water as you pleased, and thus depriving your neighbors below for twenty-one years, yes, but if not, then you have not.

Mr. **MUSSELMAN.** Then I have learned something I did not know before.

Mr. **REEDER.** I know a case where a man conceived the idea of using the water of the creek to overflow his cornfield. He said it would produce hundreds of bushels of corn for him; but in doing this he took all the water from the creek, and he was likely to get into a law suit with his neighbors in consequence, but rather than run the risk of that he abandoned his intention. But what I would like to know is in regard to dams. If a man builds a dam for his own use, no matter whether for fish or ice, or any other purpose, and that dam breaks, either by flood or accident of any kind, and the water comes out in a grand rush below and does damage, who is responsible?

Mr. **MCFARLAND.** About two yeras ago some manufcaturers above me put their dirt into the creek and the amell therefrom was so nauseating that we could not sleep at night.

Mr. **BEEBE.** Was it a healthy or an unhealthy smell?

Mr. **MCFARLAND.** It was not very healthy. It came from red oak.

Mr. **BEEBE.** You have not stated the case fully, nor your relative rights to the other parties and their rights to you, so as to enable me to answer the question. These questions are all answered in our courts with reference to the surrounding circumstances. In your question you have not even informed me as to the condition and qualities of the material you speak of. I cannot answer in general terms. I suppose it would take a lawyer three or four hours to even give an opinion on the question as stated.

Mr. **MCFARLAND.** Has any person a right to injure water or destroy it by filth?

Mr. **BEEBE.** No, sir; but still there are certain rights conceded to manufacturers and builders of mills which are not given to the private individual. No man has a right to commit a nuisance.

Mr. **PERRIN.** I want to ask one question for information. If I understood the essay correctly, it was not quite clear to me whether there was a right to use all the water from a stream or spring that is crossing my farm, provided the use is legitimate. To illustrate: Suppose I have a farm of one hundred acres, and Mr. Beebe has one just below me of the same size. There is a small stream passing through both farms, and ordinarily a portion of the water therein is consumed to water my stock and a portion passes on to supply Mr. Beebe below. Now, if the season is a dry one and the stream becomes quite small, so that it takes all that water for the legitimate use of my stock, do I understand, from the essay, that I have not the right to use enough to supply my stock in that way?

Mr. **BEEBE.** Yes.

Mr. **HERR.** I did not understand the essay so. I did not understand that I had not a right to use enough to appreciably diminish the flow.

Mr. **BEEBE.** I answer this, that you have no right to use enough. If you have purchased of some man the right to use so much water from a spring, he has the right to the balance; you can use your supply whether he gets any or not.

Mr. **PERRIN.** I did not quite understand you. Suppose this stream has its source from the spring on my farm, and the season is dry, and my cows drink all that water. Can I not use it all?

Mr. **BEEBE.** No, sir; not unless you have been accustomed to the enjoyment of it for so long a time as to have made it legal.

Mr. **PERRIN.** How much can I use of it—half of it?

Mr. **BEEBE.** That is a question for the court to determine according to the evidence in the case. There has been no statute authorizing you to use half or a quarter.

Mr. **PERRIN.** Can I use any?

Mr. **BEEBE.** Yes. The principle is laid down in the essay, if you will look at it. Where a stream continues through the lands of different individuals, and each man has been enjoying certain rights therein, he is entitled to his right or his proportion of that right.

Prof. **MCKEE.** I would like to ask, is Mr. Perrin bound to keep up a fence to keep out stray cows from coming in to drink on his farm?

Mr. **BEEBE.** I think he is responsible for any amount taken, however inappreciable. Extremes make shipwreck of principles, and when you get it down so small that you need a microscope to look at it, it becomes more difficult to solve than where there are larger proportions.

SHEEP AND THEIR HABITS—WITH SOME PRACTICAL SUGGESTIONS RELATING TO THEIR TREATMENT.

By JOHN McDOWELL, *Member from Washington.*

Read at Autumn Meeting.

Natural history, which relates to the history of animals, affords much entertainment to the unlearned and to the learned. The former will be entertained by the more obvious character of the animal he considers, by its innocence or its ferocity, by its manners, by its habits and the instinct which leads it to provide for its wants and those of its offspring.

The learned naturalist will carry his views further, he will analyze the reason, the instincts, of the animal, he will examine the internal structure and its manner of life, its form and uses of its several parts, and admire the harmony of these parts, and their adaptation to its station in the scale of beings.

It is not our purpose in this short essay to speak of the different varieties of sheep. Whether they may or may not have been from the beginning several varieties of the same species, with different qualities and instincts, these are questions which we leave with the zoologist.

I shall, therefore, confine my remarks more particularly, and speak of the sheep of the present day, and make some practical suggestions. The sheep of one hundred years ago would be discarded now as practically worthless.

The useful alterations made by the power of man in the animal creation is perhaps more obvious in the sheep than any other animal; changed in form and covering, overloaded with wool—no not yet, for it is susceptible of further increased quantity of fleece, slow in its movements, with no means of defense, without the care of man, it would soon cease to exist.

As flowers of the desert owe their brilliancy and fragrance and rich profusion to the culture of man, so have domestic birds and beasts been made to change to gratify his fancy.

What has aided man to make this change or improvement in sheep that are so admirably adapted for the supply of wool and mutton? We answer: It is now a common-received opinion, that climate, soil, pasture, and early maturity, will gradually effect a change in the quality of the wool and flesh of every breed of sheep.

Taking advantage of this fact, the scientific breeder in suitable localities, (I would here remark that all localities are not suitable to make improvements in the breeds of sheep,) by long and judicious crossing, to obtain certain points, have so improved the different breeds that our sheep are sometimes called artificial animals.

From practical observations and many years experience, we assert what everybody ought to know without such training, that sheep are naturally tame, easily domesticated, while they will frighten readily and stamp with their feet and whistle through their nostrils at the dog, yet they will offer no resentment to man. They naturally incline to herd together, and on being alarmed will rush into a solid square or bunch and face the enemy.

It is a scriptural truth that when one on being frightened strays out, it will go further and further astray, and it has often happened that when one jumps or runs into danger the others will follow. We have seen some twenty rush into a moving train, and were instantly cut and mangled and mashed up. An instance is given where a drover, in trying to drive a lot over a bridge, one leaped the side wall, the others followed and were all drowned in the surging water below.

There is perhaps no animal more regular in its time of feeding than the sheep, and this is a very important item for the sheep raiser to observe.

On pasture fields they may be seen as they go grazing along pursuing the same course each day, unless turned out of the way by man or dog.

They rise early for feeding, and on rolling fields generally travel to that part of the field where the sun first lights. The practiced shepherd who has studied their habits, on going into the field, can generally tell at any hour of the day on what part of the field the sheep may be found, although he cannot see all over the field. During the heat of the day they will be found under the shade of some tree, either lying or standing close together. If standing, their heads will be down. These places of resting soon become filthy from the daily accumulations of their droppings, and are very injurious to their health. Hence a frequent change to other pasture should be made. If all the fields are occupied with sheep, then a change or exchange from one field to another of all the lots should be made. It is much better for the sheep. They will thrive better. When these changes are made, care should be taken for a day or two to have them use the shade of a tree on a clean place. They will soon train to their line of march when grazing and to their place of lying in the heat of the day.

There should be shade trees in pasture fields for all kinds of stock.

When the summer months are past and the early frosts begin to come, if there is a hay stack in the field, at three o'clock in the afternoon the sheep may be seen feeding at it. Such is their regular habits of eating that they will take but little food out of their regular time, unless it is some kind of grain. They feed at their times of eating with a fondness on a greater variety of herbage than any other animal. Linnæus, in examining into this subject, found, by offering fresh plants to such animals in the ordinary mode of feeding, that horses ate two hundred and sixty-two species, and refused two hundred and twelve; cattle ate two hundred and seventy-six species, and refused two hundred and eighteen; while sheep took three hundred and eighty-seven species, and refused one hundred and forty-one.

The climate, soil, and pasture of Washington county are favorably adapted to the growing of fine wools, while that of the western country may increase the size of the sheep and the quantity of the fleece. In the western States and Territories sheep become too fat in summer, and the fine delicate texture of the fleece is lost.

Sheep naturally incline to hilly and dry land, and will not thrive on low, wet soils. When in winter quarters, they do better not to be too closely confined, nor is it good to give them too wide a range. It is very necessary to know their habits of eating or feeding when housed. In feeding hay in rung or box racks the hay must be put in loosely, for if it is packed, sheep will scarcely touch it; if fed in box racks they waste less, but whatever is left must be taken out of the rack. It is a singular fact that hay sheep have left or refused to eat in the box rack, if taken out and laid in a a pile on the snow or on the sod, they will eat it up or nearly so. We never could give the philosophical reason why they do it, nor have we ever heard a satisfactory reason or explanation given, for if the hay they refused and left in the box rack be changed or put into rung rack, they will eat the most of it there. We assert further, a person drinking water out of a glass goblet, the atmosphere taking the place of the liquid, immediately becomes impure in the goblet. Now, it may be on this theory, (though we don't know) that sheep refuse more of the hay or leave more hay in the box rack than they leave in the rung rack. We are not referring to the improved racks that are partly rung or partly box, but the above is mentioned to show the habits of the sheep in feeding hay.

Again, the experienced shepherd can tell what quantity of hay should be fed. The avidity with which they eat indicates cold weather, and their droppings will be more in the form of bullets, and the feed should be increased. By noticing the droppings some twelve or twenty-four hours before the change for warmer days, he will find such pasty, and require less food. In all our experience of over thirty years, we have never found these observations to vary. The sheep in winter season seem to be affected like a barometer. It is an indisputable fact that sheep in wet weather, winter, or summer, do not eat so much, and thrive so well, as in moderately cold winters, and in dry, not too dry, summers. We are not speaking of hothouse sheep, such as seldom see the sun, and never felt a drop of rain. The habits of sheep are gregarious. No range should exceed fifteen acres for summer, and a less quantity for winter. Some breeds are much more inclined to travel over their range than others. The English breeds, and the so-called native breeds, require good fences to confine them, while the Merino is easily confined with a low fence. In the winter season, sheep ought not to be roused up for early feeding of hay. Let them take their own time of rising. If grained once a day, it should be between the hours of ten, A. M., and two, P. M. However, to fatten, it is necessary to confine more closely, and feed often all they will eat. Experience has taught us, that to prepare sheep for market, we must have them fat before winter sets in. They can be put through the winter with good hay, requiring very little grain to keep up the condition. When spring begins to appear, then increase the amount of grain to all they can eat. When fat, sell. If not fat with this kind of treatment, sell any how. Sheep will do better winter and summer to have what salt they need.

It may not be amiss to say a word of encouragement to those who think of starting a flock, and who wish some information. A man with one hundred acres of land can keep from fifty to one hundred sheep at a cost governed by the cost of the produce they consume. Produce near to market commands a higher price, so that the expense of keeping sheep will be greater than that of those that are raised far from market. Of this matter, every man must be his own judge. There are but few farms in the State, if skillfully managed, that cannot afford to raise a few sheep. More than any other stock, they always advance and improve the fertility of the soil. The liquid and solid dejections distributed over the fields gradually, but surely, enriches the land. Washington county to-day is forty, if not fifty per cent., better than it was fifty years ago, made so by sheep and better farming. Let a farmer commence with twenty or twenty-five, or more, ewes, and take good care of them, he will soon find them profitable for both wool and mutton. These he may breed, and, with care, raise nearly as many lambs as he has ewes. The increase will, or should, be profit. To keep a farm fully stocked with sheep lessens the profit, since the keeping costs more. However, many of our farmers do keep a full stock, and make it pay. The outlay to begin with need not exceed $3 50 per head. Of the kind to buy, he must decide for himself—the English or mutton breeds or the Merino of some type.

Our own inclination is in favor of good stout Merino's. If there is danger of dogs killing them, they should be yarded every night. Of the summer and winter management, we have already spoken. Great care should be taken in lambing season in order to save the lambs. To obtain the quickest return for the money invested, many have their lambs dropped in February or first of March, and feed them well. At three or four months age they are sold, and bring a good price, though the sheep market may be dull and depressed, yet good lambs always command a good price, bringing as much as that paid for the ewes. The ewes may be bred till they are five years old, then fattened for the butcher, or sold or kept for breeding another year.

The secret of success in raising sheep is early maturity and keeping the sheep in good condition. If a farmer is careless, he should never start a flock nor keep a sheep.

New beginners who have had no practical training will find more valuable information by caring for and feeding the sheep himself than he will receive from books.

As an article of diet there is no food so nutritious and healthful as mutton. It helps to keep down the price of beef and pork. Every farmer ought to slay and eat of his own flock, and use less pork.

The subject being open for discussion, and Mr. W. Lee Archer of Washington county having being called upon for remarks, responded as follows:

I have no prepared address on this subject to deliver before your honorable body. It is a subject of importance, and rightfully, too, and one in which not only the people of our State, but all the American people are interested. The citizens of Pennsylvania are all more or less interested in the subject of wool growing in some of its branches.

The sheep is an animal that contributes more largely to the wants of civilization than any other animal we have in agriculture; inasmuch as it provides the material for the most necessary clothing of our people, and in that it contributes very largely to the comfort and necessities of life. Not only all kinds, but all grades of clothing are made from wool. Besides that it contributes largely to the supply of human food. Mutton in its various forms is not only a toothsome, but it is a very wholesome and nutritious article of food. It is economy to produce sheep not only for wool, but for food for the human family. At this time when other animal food has reached high prices, mutton is in demand in our large markets and reduces the price of other kinds of meat.

It is economical for an agricultural people to keep sheep with a view of improving their land. In western Pennsylvania we practice what is called mixed husbandry. We can, on a farm of one hundred acres, raise one hundred sheep; on large farms, more. We can have them mixed with other kinds of husbandry, particularly with the raising of the cereals and grains for breadstuff. It is the experience of farmers in western Pennsylvania that there is no other way by which they can so well keep up and increase the fertility of their soil. The process by which they are kept has been pretty fully detailed by my friend, Mr. McDowell. The pastures in which they travel are from year to year greatly strengthened in fertility. The soil on the surface becomes favorable to the growth of herbage for the sheep. They are light of weight, and may travel over the ground without making it compact or solid. We think there is a great advantage in pasturing even our light soils with sheep. I do not know how far the raising of sheep may be applicable to all parts of our State. We have a mountain range through the central part of the State, and such portions of the lands as are cultivated in these regions is admirably adapted to the growth of sheep and wool. The mountain sides produce an herbage on which sheep will subsist, and the valleys between are suitable for raising hay and corn for their winter food. By this branch of husbandry we can utilize thousands of acres of land now lying waste in Pennsylvania. It may not be known to all that sheep will thrive and do well in summer on the cleared lands of the mountains, where huckleberries have been grubbed out. If this industry had some more protection from dogs, by legislation, we would have many more sheep in Pennsylvania. They would increase rapidly. They would increase on small farms. They are animals that do well in numbers of five, ten, and twenty. Even in this country some of our laborers, where they have a cow to pasture, have also a few sheep, because they produce wool for clothing and flesh for food. Had they the protection that other property has, and protection from dogs, there is no reason why we should not have millions more of sheep in Pennsylvania, and a great increase in the wealth of its citizens.

Mr. VAUGHN. In regard to the mutton qualities of Merino sheep, and growth of the lambs—do the lambs grow rapidly, and come into market as soon as long-wool lambs?

Mr. ARCHER. The Merino sheep are essentially a good mutton sheep for producing lambs for the market. There are some other breeds—the South Downs, the Leicesters, and their crosses produce just as early lambs, such as go into the market at the age of from three to five months old. The Merino sheep, as a breed, comes into market at the age of three or or four years old. At four years they are at full maturity. Their mutton, at that age, is considered as valuable as that of any other breed. They will sell in East Liberty, (Pittsburgh,) or the New York markets at the highest market rate for mutton. Their weight runs from one hundred and twenty to one hundred and twenty-five pounds gross. The sheep of Washington and adjoining counties are Merino sheep, mainly. The majority of flocks are fed off at three or four years old. Their fleeces until that age are considered good. The lambs in Washington county are usually dropped from the 1st to the 20th of April, about the time that the ewes go to pasture.

Mr. **HERR.** I would like to ask whether they practice changing sheep from one farm to another, as we do in the eastern part of the State. We have no Merino sheep. We believe in changing sheep from one farm to another, if the farms are not at a great distance. They seem to thrive better. My experience is that they do much better by changing. Then I want to know the number of sheep that can be profitably put together in one flock. As my information goes, I think that varies with the breed of sheep. I am led to believe that the Cotswold do not thrive well in large flocks. We are obliged to raise them in small flocks. In Washington county, I understand they have some very large flocks of sheep. I would inquire as to the relative profits of large and small flocks?

Mr. **ARCHER.** In reply to the first question, that is, in reference to changing sheep from farm to farm, from my experience, I do not see how it does good. I have in my possession on my home farm a flock of sheep that I have had for over thirty years on one farm of two hundred acres. I have the same line of sheep—the same blood. I have what is termed a "stud-flock." We aim to improve these from year to year, and have improved them in size, quantity, and quality of wool. Our sheep are "line bred," and all of the same family. I think it may be so with any ordinary flock of fine wool sheep. I was acquainted with another flock, owned by Hon. Jesse Edgington. He had a large flock of sheep, usually about one thousand head. He had them on the same pastures nearly thirty years—I think, forty years. I do not think his sheep deteriorated any in size or constitution in that time. He was one of the pioneer breeders, and was a good breeder of stock. The second question, as to large and small flocks, I will say, in the first place, that Merino sheep can be kept in large flocks by having selected flocks; but whether it be large or small, you may run from twenty to two hundred in a flock, though it is better to have them of the same age: Yearlings, by themselves; two years old, by themselves, and so on. The question is not so much as to the number of sheep that run together, as to have them of same age and strength. I think in this county they run profitably in flocks of two hundred, where there is care to have a proper selection. Two hundred head in a flock could enter one fold to eat. It is not too many, if they are of uniform strength and age.

Mr. **BEEBE.** To what extent do you breed in and in?

Mr. **ARCHER.** In breeding sheep, we would not recommend the general wool grower to breed in and in. It may be done, but it takes very skillful work to make proper selections.

Mr. **ANDERSON**, of Washington county. I am a neighbor of Mr. Archer. I have had some experience in bringing up a poor farm, as those here acquainted with me can tell. I own a farm that had been run down about twenty-one years. It was poor before people began to deal so extensively in sheep. The man who lived on it made money enough to go to Ohio. When the farm came into the possession of my father, there was no grass at all in some of the fields, and some reflections were cast upon my father for buying it. We soon went into sheep raising, and improved it. The land is improved where the sheep lie at night. The washes from rains are

are carried over the fields. Our poor land is generally on the outer parts of the field. In that manner we can keep our fields of an even fertility. I think where the lands are too steep there is not much profit in keeping sheep; but, I think, where the hills are rolling, as in Washington county, we can improve our lands. A question was asked Mr. Archer in regard to early lambs of Merino sheep. I don't think, without more grain and milk, they will make good mutton sheep. I find the Cotswalds the earliest for market. I have some lambs now that will average one hundred and twenty-five pounds.

Mr. **MUSSELMAN**, of Somerset. I don't wish, as a farmer and as a man who has had sheep ever since I have been on a farm, to be misunderstood on this question of sheep. I know very well that sheep improve the soil; but what I want to know is, how these farmers manage their sheep, and how they sell in order to make money. That is what we have not succeeding in doing in Somerset county—to make anything out of our sheep. I would like to know how they manage and sell their wool so that they can make money out of their sheep. Drovers buy up our sheep at three and four dollars a head. We cannot make money at that price.

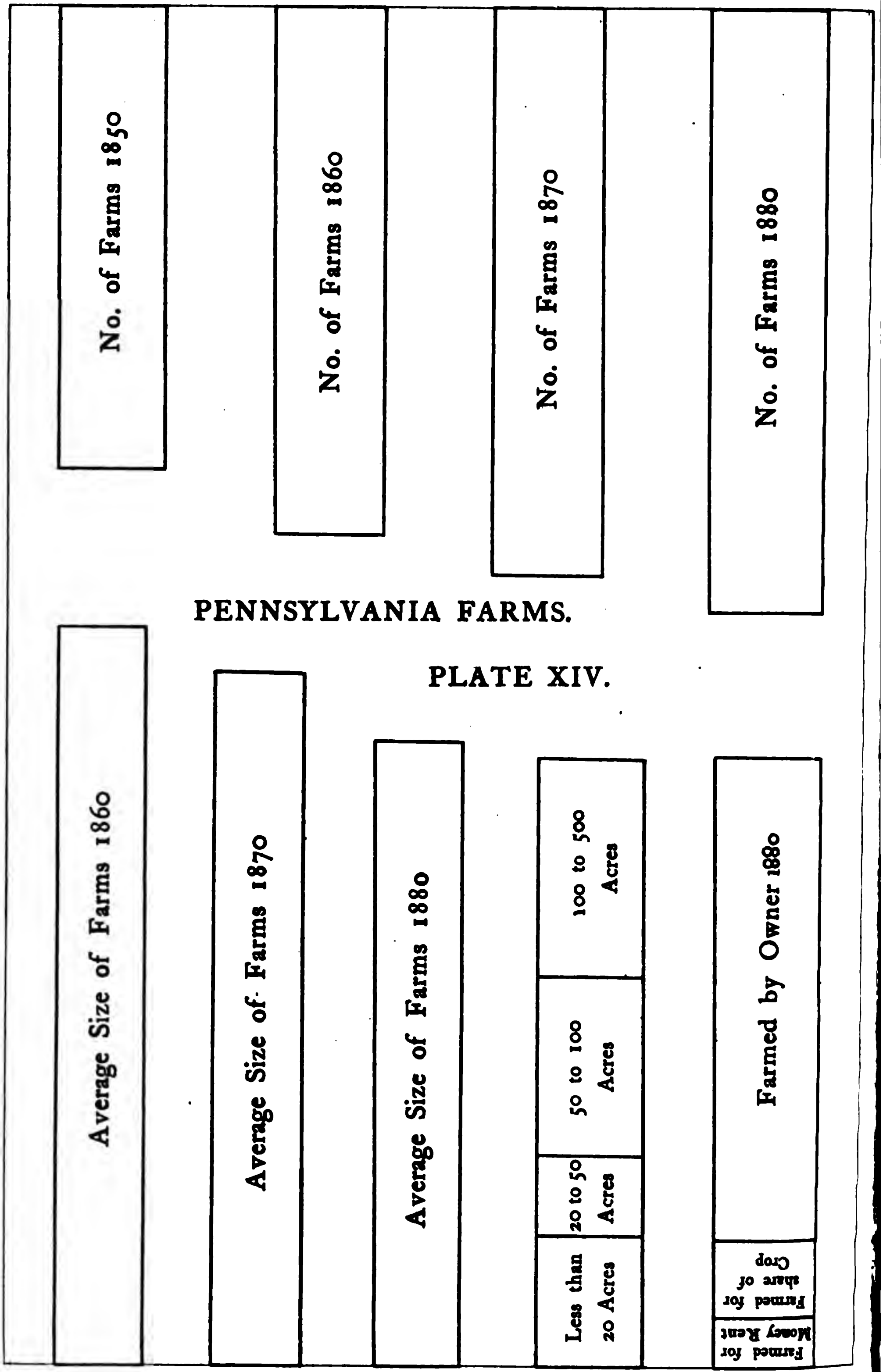
Mr. **ANDERSON**. We generally sell our wool and sheep as soon as we can and get them off to a good market. We sell our wool at thirty-eight cents and get five dollars a hundred for our wethers. There are always people to buy all kinds of sheep in our county. We generally fatten our old ewes. We have calls for sheep of all ages.

Mr. **OLIVER**. I would like to ask the farmers of Washington county which they find most profitable, cattle or sheep.

Mr. **ARCHER**. That is a question we would all like to know, what is the most profitable to us; what gives the best returns for the money invested? Now I have given my attention a great deal to sheep raising and mixed husbandry. I don't see any sheep grower that has settled down to business on lands worth sixty or ninety dollars an acre but what have succeeded, and have fixed themselves and their sons in life, as well as or better than any other class of farmers or business men we have. I think there are other Washington county men in the house who can bear me out in that testimony. There is at this time what we call a "boom" in the cattle business, and prices of pork are high. We think that if we could all change right over and procure the stock, that for a year or two we could make more money at something else. Wheat has been a good price for a year or two; but for a term of ten or twenty years our Washington county husbandmen are content to keep their Merino flocks of sheep. That has been their experience, and they think they know what they are doing. There is this in the sheep business which is a little different from any other business. You have an opportunity to save what money you get. It is not expended on a large amount of labor, it is not expended in a large outlay for tilling the soil. I think that is one secret of success in growing sheep. The outlay is small for labor and the fertilizers are from the sheep themselves. Now in reference to improving a farm. About thirty years ago, I came into possession of the farm I am on now. If mowed, all the grass on it then would not have amounted to ten tons. The fence rows were overgrown with briars. I stocked it with sheep, and the soil has greatly improved, until now when we cut and saved on one field of eleven acres this year, thirty-six bushels and forty pounds of wheat to the acre, and on another field of ten acres we had over thirty-three bushels to the acre. I have never used any commercial fertilizer except one year I drilled some salt to see what it would do for wheat. Last fall I was prevailed on to take

PENNSYLVANIA FARMS.

PLATE XIV.



out a bushel of phosphate. We depend on fertilizing the soil from the sheep or by using clover, which gives place to blue grass or timothy.

The **SECRETARY**. Can not you bring your answer down to the words, "It depends upon the man." For instance, you will succeed with sheep, your neighbor will fail. Isn't there something in the man after all?

Mr. **ARCHER**. Very much depends on the skill of the man undertaking the business. Very much depends, in any business, on a man's taste and skill.

Mr. **HERR**. I would like to ask the percentage of loss of sheep from dogs.

Mr. **ARCHER**. The percentage from natural causes, we count about five per cent.; from dogs, the loss is, I think, less in Washington county. We are, however, in Washington county a property-protecting people. We, as a people, wish to protect our sheep from prowling dogs more than in some counties where they do not regard sheep.

Mr. **HERR**. Are you not subject to foot-rot more in large flocks than small ones?

Mr. **ARCHER**. I think not. We have to use considerable watchfulness about sore-footed sheep, in this region, and this year more than usual, on account of the rains and great growth of grass. But our largest wool-growers don't discard sheep on account of this. We have foot-scald, which is different from foot-rot. It may be cured. Foot-rot in sheep is a disease that is not easily cured, but still it may be cured. A good flock-master guards well his flock from disease, as well as other influences.

THE USE OF COMMERCIAL FERTILIZERS.

By Dr. JOHN P. EDGE, *of Chester.*

Read at Spring Meeting.

It is not the intention of the writer of this paper to enter into a discussion of the merits of the different articles sold in the market as commercial fertilizers, nor the manner of their application; nor yet to give any facts from a personal knowledge, either direct or comparative, as to the results of their use.

A generation has scarcely been completed since their first introduction to any extent, in the form of mixed fertilizers. The marked results, following the use of Peruvian and other Guano's on certain crops, so enhanced the demand for, and price of them, that their place was sought to be supplied by mixtures containing a per centum of Guano, and which was, some cases perhaps, the only active stimulant to plant growth in the mixture.

There was no limit or restraint whatever placed on the manipulators of these mixtures, and, as a matter of fact, the most unblushing frauds were practiced on the farmers year after year; and many millions of dollars have been worse than thrown away on pretended fertilizers. The immense business now doing, after so many years of varied experience and costly experiment show, however, a large and growing confidence in them. Let us, therefore, make our inquiry into this branch of the question, how this outlay pays back to the farmer for his labor and cost, and first of the latter.

I have not been able to get at tables or statistics of the totals made and consumed in Pennsylvania yearly, but an estimate in my possession, from an intelligent source, puts it at sixty thousand tons, approximately.

Now the table of analysis issued by our secretary includes one hundred and ninety-one different kinds or brands, one hundred and eighty-six of which have the selling price and Professor Genth's estimated value included in the table. The former ranging from $2 00 to $52 00, and the latter from $2 05 to $56 85, and an average value of $27 70; while the average cost is $29 53, or an excess of cost over value of $1 83 average per ton.

Now, while we have no definite statements of the relative amount of sales among these several mixtures, and it may fairly be assumed that the best have the largest sale, we may yet make this statement from the figures furnished:

Sixty thousand tons, at an average cost of $29 53, ...	$1,771,800
Sixty thousand tons, estimated value of $27 70, ...	1,662,000
Excess of cost over value, ...	$109,800

Which the farmers of Pennsylvania are presumed to pay annually as a margin to manufacturers and their agents. This does not, however, give us the actual value of these artcles to the consumer.

But the facts above stated are intended to point to the benefits accruing to the farmers and truckmen in bringing the cost and value so near each other, as a direct result of the operation of the law of June 28, 1879. We can only guess at what it may have been before the restraints of this act were enforced, when the only limits to deception were elasticity of conscience and respect for business reputation on the side of the manufacturer and dealer.

Large quantities of the low grades, those having the widest range between value and cost, are still sold. The extreme of this range, as shown in the table referred to, is in No. 85, of which large quantities are sold in Pennsylvania to my personal knowledge, and agents are active in placing it on the market, in the eastern counties. No. 85, value $2 05; cost $15 or near seven hundred per cent. of its value. The extreme on the side favorable to consumer is in No. 115, costing $45 and estimated worth $61 39.

It is to be regretted that the only means through which consumers can be informed, officially, of the results of the investigations of this Board, are in the pages of the quarterly reports, which are limited to one thousand copies, and in the annual report, which is published more than a year after the information has been obtained, and therefore loses much of its force or value, especially as the great bulk of these reports get into the hands of political workers, rather than tillers of the soil. Some plan should be matured by which these tables of analyses would be promptly and largely spread before the people.

As to the other branch of the subject, I am positive that, while the results of the use of fertilizers, such as are now in question, have been a greatly increased production, that increase has not paid for the cost. This assertion will excite debate and doubt. But the fact remains that where the value and the cost are so closely calculated, nothing but the application of the greatest skill and most intelligent experience can secure a profit from so small a margin. And when we do know that, in a large portion of the cases where they are used, it is done experimentally, and without having studied the best methods or material fitness of the agent for the special use in hand, the best results can scarcely be expected.

The published results of trials at experimental stations, model farms under the direction of fairs, &c., &c., confirm this position. I need only refer you to the statement of trials of the most reliable ingredients that enter into these compounds, made in various forms of combination, and on different kinds of crops, at the Central and Eastern Experimental Farms, as reported by the authority of the State College, in the report for last year. These tables show such various results, as to lead to no further conclusion than that in a soil, limestone clay, which had not been manured for five years, as good comparative results were recorded where nothing was used as for the best of fertilizers, as applied to oats; while in no single instance, except in that of ground plaster, did the increase in value of product meet the cost of fertilizers; and where the highest grades of manures were applied, the cost was nearly three times the value of increase in yield of crops.

The tables of experiments on corn give even a more discouraging showing, as in no case did the increase meet the cost. All these experiments, and all the above references to cost, do not include the cost of handling or the interest on the money used in the operation.

The labors of this Board in this field of inquiry, and the aid and protection due from it to the people, are, in my opinion, merely begun, and the results to them of a faithful discharge of its duty are beyond estimate.

A very important matter to the purchaser and consumer, is the large per cent. of inert matter on which he has to pay charges of freight, handling, hauling, &c., &c. One of the duties of the Board is to so intruct farmers and truckmen that they may produce their own mixtures from the raw materials, which are sold as fertilizer supplies, and by which they can secure all the good derived from these bulky and costly compounds now used.

The New Hampshire and Vermont Boards, and it may be others, supply from their offices formulas and instructions for simple and inexpensive methods, that enable any one to combine the active plant food agents, on their own premises, thus saving the margins paid to manufacturers and salesmen. It is in these matters of practical instruction, (and information,) that we can best serve the objects for which this Board was created.

In this connection permit me to refer to the remarks made by myself, when the bill establishing this Board was on third reading in the House of Representatives, and, by the way, it was the only speech made in either House in its favor. In speaking of the purposes of the bill, I said: "It is to aid in protecting the farmers against the frauds, now so widely practiced, in the item of commercial fertilizers as sold in our markets, by having tests made and published, so that every man who has occasion to deal in them may know whereof he buys. The farmers of this country have been robbed of millions of dollars in these mixtures, and the authorized publication of these analyses will effectually check this fraud, and pay back to the State far more than she invests in her Board of Agriculture."

I have only one more suggestion to add. It is this: Great as are the apparent benefits to the harvests of our State, by the use of commercial fertilizers, it is my unqualified belief that if those who have paid, in the long run, such large sums of money for them, had devoted the same amount in developing the resources of their poultry-yards, pig-styes, muck swamps, sinks, and sewers, and every other domestic source of manure supply, to their full capacity in that direction, both farm and owner would, in a large majority of cases, be richer now. There are plenty of farmers who buy liberally of these artificial manures, who allow much more in value of plant-food to escape by the barn-yard drain, without a moment's thought to save and use it.

The subject matter of the essay being open to discussion:

Mr. HERR. One thought suggest itself to me, referred to in the essay, which I think is a practical one—that of posting the agriculturists of the State as to the value of these fertilizres, so that they can get the crude materials themselves, and with a formula, which might be issued by the Board of Agriculture, know how to manipulate them, and enable them to apply them to the various kinds of soil in the State. It is a very important thought to my mind. I think I would very much prefer buying the necessary crude material, and supplying the cheaper articles from home, than to pay heavy freights on bulk matter from a long distance.

The SECRETARY. In reply to the suggestion of Mr, Herr, (and I think I also speak for Dr. Edge, who is unfortunately absent,) that I would not advise farmers to compound their own fertilizers. To do so, we must still depend upon the business integrity of the dealer in such materials, who, if not a manufacturer himself, has a no higher grade of business integrity than has the regular manufacturer. So far as any certainty of getting what you need is concerned, your chances are no better with the crude materials (unmixed) than they are with the marketable fertilizer. If the manufacturer of the fertilizer, as placed on the market, cannot be depended upon for the grade and quality of that fertilizer, he is not more to be trusted when he furnishes crude material, of which the farmer knows no more than he does of the mixture. A manufacturer of large amounts can mix the material much cheaper than the individual farmer can, and will be just as likely to supply just what is wanted of the mixed article as of each ingredient. Buy only of responsible men; men who have a business credit in the trade; men whose standing in the trade is worth something to themselves. It has been my fortune to come into contact with "fertilizer men" at all points of the trade; as a consumer on my own farm; as one of the staff of one of our leading dailies; as the secretary of your Board, in search of samples, and as a man in business, and I have always tried to persuade our farmers to get rid of the idea (which so many of them cling so firmly to,) that fertilizer manufacturers, as a class, are always trying to get the better of the consumers of their goods; always trying to palm off a comparatively worthless article upon farmers; always trying to furnish an article not worth the price asked. We have, in all branches of the fertilizer trade, (even including agents,) men whose business standing and integrity is as dear to them as that of any man here; we have manufacturers who have, by a long series of years' work, established the leading brands which they sell, and which when placed upon a bag or package, mean something. I need not mention the names of any of these men or firms, but you will find them in all places where the trade exists. If farmers would buy of such men, and of such men only, we would hear much less of "fraud in fertilizers," as one member has styled it. Nor can I see why there should necessarily be any antagonism of interest between buyer and seller, between manufacturer and consumer, in this class of goods, than in any other with which we deal. Neither class are, by any means, saints, and many of us need considerable alteration before wings will sprout. It always makes one doubt human nature, when in going to buy potatoes from a farmer, to hear the boy ask whether he shall bring the red half-bushel or the blue one. Buy only of responsible men, who will, at least, try to give you what you want.

But you charge that, notwithstanding all this, there is fraud in the trade, and that fraudulent goods are on the market, and I admit the charge, for it were useless to deny it, when our official analyses show several instances of it, and leave just room for us to suppose that some exist which have not been thus detected; but is it not possible that the consumer may in some measure be responsible for this? Fraud exists in all trades, but we find it in all other cases to be caused by a demand for a low-priced (misnamed cheap) article, and I believe to-day that the worst hindrance to the greatly increased use of fertilizers is to be found in the mistaken demand for low-priced articles, in the purchase of which the consumer has far more regard for cost than value. Goods, which were they worth the money paid, would be *comparatively* dear. To illustrate my meaning more plainly: as the market now stands, we can buy an article of dissolved South Carolina rock, containing, say, twelve and one half per cent. of available phosphoric acid, for twenty-five dollars per ton, or two dollars per hundred weight, or unit, of available acid; in other words, the consumer can in three tons get seven hundred and fifty pounds of available phosphoric acid for seventy-five dollars. Now, for example, suppose any manufacturer were to place on the market an article containing thirty-seven and one half per cent. of soluble phosphoric acid, and offer it for seventy-five dollars per ton, how many tons per year would he sell? One ton of this latter article would give him the seven hundred and fifty pounds of avaible acid at the same cost as in the three tons, and he would save the freight of two tons, save the handling of two tons of the other, and run no more risk of being cheated in his goods. In our official investigation into the trade of fertilizers, as enforced by our selection of samples for analyses, we find that fraud exists in inverse proportion to the prices of the goods; that is, we find more fraud to the hundred dollars in low-priced goods than in high-priced ones, and we assert that in the market, as we now find it, there is double the proportion of fraud per hundred dollars in goods selling for twenty dollars or less per ton than there is in those selling for twenty-five dollars or more.

There is one point in the essay to which, without wishing to act the critic, I wish to draw your attention, viz: The comparison between " Cost " and " Estimated commercial value per ton." The essayist states that taking our published table of analyses as a guide, he finds the *average* cost to have been $29 53, when the average commercial value is but $27 70. From this, the essayist reasons that the farmers lose $1 83 per ton, or $109,800 on the gross consumption of sixty thousand tons. This deduction, while on its face apparently fair, does not do justice to the manufacturers of this class of goods. To illustrate: Suppose we select any brand of goods containing phosphoric acid, potash, and ammonia which we may find on the list, and in the open market; buy ingredients which contain these elements in the proper proportions to give an article which will yield the same analyses. To do this, we must buy our ingredients at the prices named in the table, and must, before the mixture can be sold for even first cost, add the cost of mixing the materials. To this cost of mixing, the manufacturer must add freight; commission to agents; and interest for sales which very often, at least to agents, must be made on time or credit. If the material cost within two dollars per ton of the price of the manufactured goods, the business would be a losing one to the manufacturers.

The English consumer thoroughly understands the importance of a concentrated fertilizer. The English farmer is not averse to buying a high-priced manure, and, provided the proportionate value is the same, will always give the higher priced fertilizer the preference. One of our leading manufacturers tried the experiment of importing a high grade of dissolved South Carolina rock from England. It was guaranteed to contain thirty-one per per cent. of available phosphoric acid, and could not be put on the market at less than sixty dollars per ton. It met with no sale except to manufacturers; but at the price named was the cheapest source of available phosphoric acid, and manufacturers soon found it out. The per cent. thus made soluble will only vary with the price which the consumer is willing to pay.

Mr. HERR. I think the term " commercial value," as used in the table of analysis, is confusing, and does not convey the proper idea.

The SECRETARY. I have tried to find some substitute for these words, but have not yet been able to get such as would better convey our meaning, viz: the value of the constituent elements in the open market. Those into whose hands our tabulated analyses fall, must not confound the two terms " Commercial value " and " Agriculture value," for there is, or may be, no connection between them. The commercial value will, as before stated, depend upon the amount and market value of the ingredients used. The agricultural value is to be measured by the effect upon the crop or soil. It has been clearly proven, and it is a fact beyond a doubt, that the value of a fertilizer depends upon its phosphoric acid, potash, and ammonia. Nothing which we can control will better show the existence and relative proportion of these than chemical analyses. The agricultural value (actual effect) will vary with the soil, crop, and season. One year, owing to want of moisture or other causes, a fertilizer, with a given proportion of these three elements, may fail. Next season exactly the same fertilizer applied to the same soil and crop may give excellent results.

As the table of analyses is now under discussion, I wish to say that there is one column in it which gives us by far more trouble, and is far more confusing to the reader and ourselves, and that is the column of " Selling price." It is true that we give the selling price at the point at which the samples was taken, but this is liable to mislead the casual reader. Suppose I take a sample of the goods of your well-known Allentown Manufacturing Company, here near the factory, and in the column of " Selling price," give the cost to the farmer at the factory. Suppose we take a second sample of the same goods at Pittsburgh, where freight must be added to factory price, would a comparison be fair or just? And yet this is what our column of " Selling price " practically enforces, viz: the unfair comparison of goods of equal grades at different distances from the point of production or manufacture. The Ohio State Board has, for this reason, entirely discarded the column of " Selling price," and now expects the reader to take instead the price of the same goods at his own railroad station.

Mr. BEEBE, of Venango. The idea is that farmers should utilize all their resources, as a general thing, to supply these manures and save themselves investment; yet still I do not like to throw out the idea that the essayist seemingly does, that the use of these manufactured fertilizers is profitless to farmers. There are thousands of tons used in this way: the farms are worn out, or very often it is the case, in many counties of Pennsylvania, where the land will not produce a crop without them, they have not these resources from the barn-yard, and the men who own these lands desire to have them improved. You take a given amount of fertilizer to the acre. You, perhaps, do not get in the grain crop a sufficient number of bushels in addition to be called a good return; but you get a good catch of clover, and upon that improved condition you can base your action, and continue to improve your soil thereafter, as you can in no other way. There are thousands of acres found in Pennsylvania where such a result would be desirable, not only in restoring the crops, but in restoring land not useful. Let me say that farmers use too many kinds of fertilizers, instead of keeping to bone dust. For my part, I have changed my method to using bone dust largely, instead of super-phosphates. The first year one may be disappointed, but you can see good results for five or six years, to a limited degree.

Mr. **Garretson**, of Adams. The remarks of our Secretary were admirable, and meet my views exactly. I have had some experience in the manufacture of home-made fertilizers from formulas. They have proven unsatisfactory. They involve too much hard labor, and the manufacturer, with his improved machinery, can do it much more economically than we can do it. If done on the barn-floor, by the farmer, the mixture is not sufficiently complete to accomplish the best results. The materials should be closely ground together, and this can only be economically done by the manufacturer, who has the requisite machinery. I agree with the member from Venango, (Mr. Beebe,) that bone dust is the proper article. We may have to wait longer for results, but they will come, and in ten years' work will beat all or any of the super-phosphates now in the market. I have demonstrated my faith by using ten to twelve tons this season. I wish to indorse what has been said. Buy only of reliable men, and buy only upon the guarantee of responsible parties. *Know what you want, and know when you get it*, is the motto for us.

Mr. **John McAllister**. I have listened very attentively to all the remarks that have been made here in regard to phosphates. For sixteen or more years I have been using them every year. This year I shall cover more than twenty acres with them. I do not agree with the last paper read on the subject of phosphates: that they are useless, and do not pay expenses. I agree with the gentleman who showed very clearly, no matter what the article costs, provided it gives that that produces the result. I bought these phosphates from our own manufacturers here, and I shall every year use them. I can go out over the farm and point to the very row where this phosphate has been put. We can see it not only the first year, but can see good results for three or four years, or more, upon grass, and without grass a farmer cannot keep his land up.

This idea of South Carolina rock is something new to me. I am going to use several tons on my tenement farm this year. What is the difference between South Carolina rock and real bone? That is the question which has been running through my mind. How can this South Carolina rock take the place of real bone? Because after all the real bone is what we want; it is the article that lasts from year to year. Phosphates tell immediately, of course. If any person wants a quick return for the money, use phosphate; but if you want to bring up your soil, use bone. But I agree with the gentleman who remarked "It is not so much the price of the article, it is the result." There has been a great deal of swindling in this bone dust, and in the making of all artificial manures; but we ought to be sensible enough not to be swindled. If we buy the bone for twenty dollars, when we know we cannot get the genuine article for less than thirty dollars, we allow ourselves to be swindled, and pay a premium for swindling. That is the mistake we farmers make. If the essayist has experimented upon it, he has been cheated by a very poor article.

When he has no opportunity offered to secure the manure from barnyards in cities, or sufficient quantity of manure from his own farm, then he must go outside. The only question to be discussed is: What is the best kind of manure? And that is the reason I rose to ask the question in regard to South Carolina rock. And I address my question to the Secretary.

Secretary **Edge**. If I answer the gentleman's question, I must do so as a farmer, and not as a chemist, for I have no claim to the latter profession. The material alluded to goes under several names, South Carolina rock, South Carolina bone, mineral bone, &c., &c., and is found as a deposit near

Charleston, South Carolina. Of its formation, I can say but little, further than that as is usual, there are several theories to account for its presence, and can only say that it is found near the banks of the Cooper, Stone, Ashley, Coosaw, and Ellisto rivers. The rock contains a varying proportion of phosphate of lime, that of one mining company running as high as 69 per cent. of phosphate of lime, or richer than ordinary bone. This material when ground into a fine powder is treated with sulphuric acid, when by a change in the proportion of lime a portion of the phosphate becomes soluble or available; this latter amount depends in some measure on the manner of manipulation and the proportion of acid used. In our ordinary dissolved South Carolina rock, the amount available varies from 10 to 15 per cent., or say from 200 to 300 pounds per ton. Under English patents as much as 600 or more pounds per ton are made "available," but at an increased expense which prohibits its sale for less than say $2 per unit, or $60 per ton. The available phosphoric acid from South Carolina rock is of as much value per pound as the available acid produced by bone treated with sulphuric acid, but I do not think that the balance, (not directly available or soluble,) is as valuable, and hence I prefer the bone, or the pure bone treated with acid only.

Mr. ———. When I first commenced the use of phosphates, we only knew the article made by treating bone dust with sulphuric acid; it had a certain acid smell, which does not seem to belong to the phosphates of the present day. Can the Secretary explain this change in odor?

Secretary **EDGE**. I can only explain it on the theory that many of our manufacturers use what are known in the trade as "Refuse acids"—acids which have been used in other processes first, as, for instance, in the refining of some of the products of petroleum. These refuse or "Sludge" acids as they are called, of course take up some of the impurities of the substances with which they are used and (in fact are used because they will take up these substances) thus obtain the peculiar odor to which the gentleman alludes.

Mr. **BEEBE**, of Venango. Can the Secretary tell us anything of English law in relation to the application of fertilizers by a tenant who has no direct ownership in the soil.

Secretary **EDGE**. English law or English farm leases give the *outgoing* tenant a fixed payment for the fertilizers which he may have applied during the closing years of his lease. If, for instance, it is assumed that raw bone will last eight years, the outgoing tenant receives from the landlord or *incoming* tenant seven eighths of the cost of the bone put in during the last year he was on the farm. For that applied during the year preceding the last he gets two eighths or the fourth, and so on in the same proportion as may be fixed by the terms of his lease; and this plan applies to lime and other applications, as agreed upon by landlord and tenant by the lease. If no provision is made in the lease I think the law fixes the drawback due the outgoing tenant. Most of the land in England is let upon long leases of seven to sixteen years, and without some such provision it would not pay the tenant to keep up the farm during the closing years of his lease. I have such an arrangement with my own tenant. For all fertilizers applied during the last year which he remains on the farm I repay him a fixed proportion of the cost, otherwise I would not expect him to keep up the farm as I want it kept up. I return him one half of all applied the last year he is an occupant of the farm.

Mr. **BEEBE**, of Venango. One question more. Our Secretary, as I understood him, said that available phosphoric acid from South Carolina rock is worth as much pound for pound as that from bone, and that the same may be said of *available* phosphoric acid from any source. Can the same be said of nitrogen in ammonia.

Secretary **EDGE**. No, sir; and yet it is probable that the distinctions which are made are more theoretical than practical. In the Connecticut valuations, nine variations are made in fixing the price of ammonia, running from eleven up to twenty-six cents per pound. Five grades are made of nitrogen derived from bone. These vary with the fineness of the bone, the value being highest when derived from fine bone, and lowest when taken from the coarser bone. These five grades vary in valuation from eleven to fifteen cents per pound. The highest value (twenty-six to twenty-eight cents) is given to nitrogen derived from nitrates and ammonia salts. Another grade is given to nitrogen from blood. Another to that derived from cotton-seed, linseed, &c. Prof. Genth has not adopted these values, because he considers them more fanciful than real, and as having a tendency to mystify and confuse the uninitiated. In fact, I very much doubt whether there is any great difference in *available* nitrogen from different sources. If it is available, that is the important point, and the source is but a secondary affair. But let me explain what I mean by available. Some fail to appreciate the full meaning of the term when applied to ammonia, and one who is in a position to disseminate his opionion has asserted that the action of our law is unfavorable to the consumers of fertilizers, because our analyses will show the nitrogen derived from ground leather scraps, when in fact it is of no use to the crops. Our reply to this is that Prof. Genth's analysis shows *available* nitrogen. That obtained from ground dried leather scrap or old shoes is not available, and hence is not shown by the analyses. Manufacturers know this. No manufacturer who has a reputation at stake will use leather scrap as a source of ammonia.

Mr. **MCALLISTER**. How about the potash or Jersey marl? Those who sell it claim a much higher percentage of potash than your analysis shows.

Secretary **EDGE**. What I have just said also applies to potash. Dr. Genth's analyses give *available* potash only. Marl contains more potash than our analyses shows, but the overplus is in an insoluble form, and not being available, Dr. Genth declines to allow credit for it. Raw (not acidulated) South Carolina rock contains a large percentage of phosphoric acid, not soluble or available. Our analyses only credits it with that which is actually available for the use of the crops. The difference between the analyses shown and claimed by the dealers in marl and that in our table is, that the former shows all of the potash, and the latter only that which is available. Dr. Genth goes on the principle that it is not the grain in the feed-chest which makes the horse fat, but that it is the grain which he eats and digests which does him good.

Mr. **BEEBE**. How about ground limestone?

Secretary **EDGE**. I think it is another case of plenty of food in the grain-chest, but none in the horse's feed-box. Ground limestone can possess nothing of value but lime, and this in an insoluble form. Even if it were not insoluble it can be obtained at a cheaper rate when burned, and applied in the form of a powder.

FRUIT CULTURE.

By G. HIESTER, *Member from Dauphin.*

Read at the Spring Meeting.

There are several reasons why the farmers of Pennsylvania should now pay special attention to fruit culture.

First, because it will pay, and it will pay exactly in proportion to the amount of care and judicious attention that is expended upon it.

The time has arrived in the history of Pennsylvania when farms can no longer be worked profitably in grain. The present complete system of railroads and telegraphs has brought the fertile prairies of the west so close to the sea board that we can not compete with them, and many even of our most careful and economic managers are leaving their farms for other employments, because, they say they can no longer support their families, but each succeeding year finds them a little further behind financially than the last. It is useless to dispute this fact, and it is equally useless to charge the causes to the railroad companies for discriminating against us in their freight rates, or to try to better our condition by securing better rates.

We must make up our minds that it is folly for us to try to compete with the west in the grain market and retire gracefully from the field, but not from our farms. I hold and shall try to prove, that the Pennsylvania farmer can make a better living to-day, and make it easier, and get more solid enjoyment as he goes along, than the farmer of fifty years ago, in the good old times we hear and read so much about. With ordinary good care every acre planted in fruit can be made to yield an average of $200 annually, or a clear profit over all expenses of $100, after making due allowance for partial failure of some crops caused by unfavorable seasons over which we have no control.

Let me illustrate: one acre of strawberries, well cared for, will produce from 4,000 to 8,000 boxes of fruit; I have heard of 12,000 boxes being gathered, but never saw such a crop. The first year it yields nothing; the second and third years it will yield say 4,000 boxes each, which is the smallest crop I have yet gathered, making 8,000 boxes in three years; these, if sold at ten cents, will give you $800 in three years, or $260 per annum, while, with extra care and attention, these results can be doubled. Raspberries and blackberries vary but little from the strawberry in yield and price, but do not always find so ready a market.

An acre of ground contains 680 grape vines, if planted 8 feet by 8 feet; taking 12 pounds as the yield per vine, we have 8,160 pounds of grape, which, at 4 cents per pound, gives you $326 40, while the cost of cultivating and harvesting is about the same as for corn. An acre of standard pears, planted 20 by 20 contains 108 trees. If these yield 3 bushels per tree, it makes 324 bushels at $2 per bushel, equals $648. The result will be about the same as dwarf trees are used, as they are planted much closer and consequently you have a greater number of trees. An acre of apples planted 40 by 40 contains 27 trees; if these yield 15 bushels each, it makes 335 bushels, at 50 cents—$177 50, besides the cider made from windfalls, and so on through your list. Now, if you plant your strawberries, blackberries, raspberries, currants, and gooseberries between the rows of trees in your orchard, you can readily see how a large return may be taken off a small piece of land, and also how we can guard against a total failure of any portion of our farm, as it is very seldom that we have a total failure of both large and small fruits in any one year. In the above illustration I have placed the yield below the average, and have given the lowest average price that I have ever obtained for any of my good fruit. For instance, I put strawberries at 10 cents, when I have frequently sold them for 25 cents, while for my best peaches I have received $3, for pears $4, for apples $2 50 per bushel. When these prices are obtained for the fruit, and the amount of fruit produced is increased by careful cultivation, a very material difference will be made in the amount of profit per acre. With the best of care the cost of cultivating and harvesting need not exceed $100.

Second. It is the most pleasant and fascinating occupation that a man can engage in. There is less of drudgery and more of skill required than in any other branch of agriculture. What can be more delightful than to spend the early spring days in the orchard among young and thrifty trees, vines, and small fruit plants, and watch them day by day as they grow into beauty and profit under your fostering care. As the weather warms, to see them put forth the tender green leaf, then the blossom, and finally as the warm weather of summer appears, and from that time on through the long summer and fall, to see the luscious fruit ripen, each variety in succession giving you the reward of your labor, gladdening your eye with their beautiful color and fair forms, pleasing your palate with a variety of delightful flavors, refreshing your whole being with healthful and delicious food, and filling your purse, thus enabling the fruit-grower to stand on the same plane socially with other business men, as it gives him that wherewith he *may* educate himself and his family, and surround his home with those comforts and luxuries which contribute so much towards making life enjoyable. The fruit-grower is brought daily in contact with nature, and becomes intimately acquainted with her laws. By the knowledge of these and their careful application he is enabled to carry out his designs, forming the well-shaped tree, producing new varieties, perpetuating the good qualities of those he already has, ard combining all that is good in several varieties, while he eliminates what is bad from the time he plants the seed, knowing that every operation he performs will show for good or bad in the future tree. As he places the bud or graft he determines the quality of the fruit, and then every cut of his knife, as he shapes the head of the young tree, will leave an impress on its future shape which will never be effaced, and as the tree grows he can look upon it as just entirely the work of his own hands, as the veriest piece of mechanism, for while he cannot supply the sunshine and the gentle shower to warm and refresh it, yet he does take hold of nature's laws and applies them to each individual tree, thus causing nature to work out his will and produce the result that he has contemplated from the beginning; and it is just this that fascinates all who engage in the culture of fruits and binds them to their profession, so that they can seldom be induced to give it up for any other. Just here I want to answer a question that was asked at the meeting last winter. How shall we make our boys work, and how shall we make them stay on the farm? I say, give them work that is pleasant to do and that requires skill rather than muscle, work that will pay as well as anything else they can put their hands to. Teach them that wealth is desirable in proportion as its use can make us comfortable and happy; that the wealthiest men are not by any means the happiest; that an honorable name and a contented mind are more to be desired than great riches. Then give them plenty of luscious fruit to eat and teach them how to grow it. As soon as they are able to hold a knife, teach them to bud, and graft, and prune; explain to them how trees grow, the functions of the different parts—as the roots, branches, leaves, flowers, &c.—the laws of reproduction, and the methods employed to produce new varieties: then allow them to experiment for themselves, and aid them with suggestions, but do not burden them with hard tasks; take them with you when you are working in your orchards and vineyards; make them your assistants and not your drudges. In the winter let them, under your direction, make your root grafts of apple and pear; in the summer bud your peaches. Let them plant the young orchards and grow up along with your trees and give them an interest in the profits. If you will follow this plan you will find that, instead of having to coax them to stay on the farm, nothing will induce them to leave, and if you have a large family you may be obliged to buy an extra farm or two to accommodate the boys. Remember that any clodhopper can clean a cow-stable, thin corn, and pick stones, but skilled labor is required in your orchards and vineyards.

Third. It is specially adapted to small farms, fifty acres judiciously planted in fruit, and properly cared for, will yield a better return in cash than five hundred acres farmed in grain; and this State is being rapidly cut up into small farms.

Fourth. The broken land that is so hilly, broken, and rocky, that it cannot be worked with any profit in grain, can be turned to good account by planting it with fruit trees and vines. Many of the finest peaches, grapes, and strawberries that are brought to the Harrisburg market are raised among the York hills, on land that is almost worthless for ordinary farm purposes, on account of its broken, rough character; some of the orchards are on hills so steep that a wagon cannot be used on them; but all the hauling must be done on sleds, yet, these very hills appear to be particularly adapted to the production of peaches and grapes.

I think the finest peach orchard I ever saw was one planted by Tobias Martin, in Franklin county, in an old blackberry bramble on the side of the mountain. I walked and crawled through it, (for many of the rocks were so large that we had to get over them on our hands and knees,) when the peaches were getting ripe, the fourth year after planting, and I never saw trees more uniform in size, in productiveness, and in the quality of their fruit. One of the oldest and most successful fruit growers of York county, tells me that he uses no trellis for his grapes, but lets them climb over the rocks, and he never fails to have a good crop. Of course this rough land cannot be double-cropped with large and small fruit both, as a nice smooth field could, but it will yield one crop of fruit annually that will pay four-fold better than the best land farmed in grain. This State contains thousands of acres of broken, rough land, which has never paid one dollar of profit to the owner, and never will, if farmed as it is at present. Now, if there is a farmer in this State who is not satisfied with the returns he is getting from his land, let him turn his attention to the culture of fruit, remembering that while his best and richest fields are not too good to be used for this purpose, his rough broken land that appears to be utterly worthless to him is not too rough, but will abundantly repay him for all his labor, if judiciously applied.

In order, however, to secure the best results, a man must be peculiarly fitted for the business by thorough training and actual experience. He must know how to grow the different varieties of fruit in perfection; he must, by actual observation, know just what varieties succeed best in his locality; he must know just when to gather his fruit, and how to pack it so as to present the best appearance in market; and last, but not least, he must know how, when, and where to sell. If a man fails in any one particular, although he may have done exactly right in all the rest, he will fall far short of the best results. For this reason, it is best to begin on a small scale, and each year, as he gains experience and a knowledge of the business, and becomes known in the markets, to enlarge his orchards. It is true of the fruit grower, as well as those engaged in other business, he must be a boy before he can become a man.

There are a few general rules that apply equally to large and small fruits, upon the careful observance of which our success will very largely depend:

I. LOCATION.—Before planting, we should look over our land, and decide upon what fruits we will grow, and where we will locate each variety, for although most fruits will adapt themselves to almost any soil, and although I do not believe there is a farm in the State with the land lying high enough to insure thorough drainage on which all the fruits cannot be successfully cultivated, yet it will be found that, owing to certain peculiarities in the soil and sub-soil, the lay of the land, whether high or low, hilly or flat, some fruit will do better than others, and those, of course, should be planted most extensively, and each planted where we have reason to believe it will do best. Thus, if our farm is specially adapted to the growth of peaches, we should plant peaches principally; if we find that pears do best, then we should make them our specialty, and so on.

II. SOIL.—Much has been said and written about the kind of soil best adapted to the different varieties of fruit. I would say, in this connection, the cherry requires a dry soil. It will grow on much thinner and dryer soils than most other fruit trees; but to obtain the finest fruit, a deep mellow gravelly or sandy soil is desirable.

The favorite soil for the apple in all countries is a deep strong gravelly, marly, or clayey loam, or a strong sandy loam on a gravelly sub-soil. Such land produces the greatest crops and highest flavored fruit, and will support the trees to a greater age than any other, yet many orchards in New England are very flourishing and productive on soils so stony and rock-covered (though naturally fertile) as to be unfit for any other purpose.

The pear succeeds best on a strong deep loam, with a dry sub-soil. It will adapt itself to any rich well-drained soil, but will do no good on ground that is wet for any considerable portion of the year.

The plum will grow vigorously in almost every part of this country, but only bears its finest and heaviest crops on heavy loams, or soils in which there is a considerable mixture of clay.

For the grape, a limestone soil, or one composed of decaying calcareous rock, is the best, although our native varieties grow well on any strong land. The best results are obtained on land that is light and dry, deep and rich.

It is the general impression that the quince should be planted in some low wet place, and that it will not succeed in warm dry ground. This is a great mistake. No fruit tree should be planted in ground on which water will stand for one day after a rain, and if the quince is planted in such a place, although it may live, the fruit will generally be knotty and inferior. Give it a deep rich mellow soil and it will grow vigorously and bear abundant crops of large and fair fruit. No tree is more benefited by manure than the quince, and none will yield a better return for its frequent application.

The small fruits delight in a deep rich loam, but will succeed well in any soil, provided it is deep, rich, and mellow.

In the above I have tried to show that the one great essential to success in fruit culture, no matter what kind we grow, whether large or small, is that the soil be deep, rich, and mellow, and well-drained, either naturally through a porous sub-soil or artificially by means of under-drains. I think it is a grand mistake some writers have fallen into, to recommend the planting of some varieties on poor thin soil, as they claim they will run all to wood if planted in rich ground. I do not believe there is a single plant, vine, or tree that will not produce more fruit and better fruit, and bear for a greater number of years if planted in deep rich soil, that is kept deep by constant deep cultivation, and kept rich by the constant addition of fertilizers, than if grown in a poor soil with shallow cultivation with no fertilizers. The fact that thousands of acres of the light sandy soil of Maryland and Delaware have been profitably used in the production of peaches is no proof to the contrary of this assertion, as is shown by the short lives of trees grown on those lands. If we want to make fruit-growing profitable, we must first grow a large healthy tree, plant, or vine, then let it come into bearing gradually, so as not to impair its vigor by allowing it to overbear the first year. The best way to prevent the tendency to overbear is to keep the ground so rich that the trees will make a fair growth of wood each year.

Ninety-nine peach orchards out of every hundred are ruined by being allowed to overbear in the fourth year. Few men have the nerve to force a heavy growth of wood on the trees at this time, when they know that by so doing will lesson the crop for that year, but for every bushel of fruit that they lose by so doing, they will gain ten in the years that follow, and this rule will apply equally to all the trees, vines, and plants on the list, not even excepting the blackberry.

SELECTION OF VARIETIES.—In the selection of varieties, we should take those which we see do well in our own locality, and plant only a few of the best. It is a great mistake to plant a great many varieties. All that we want is enough to give us an unbroken succession of fruit through the entire season, and the bulk of our fruit should come in late, because the early varieties come in just at the time when our markets are filled with the product of Maryland and Delaware, which, of course, affects the price to a certain extent, and because the early varieties are not as good keepers as the later ones, and have to be sold for immediate consumption, while the late varieties are always in demand for canning and preserving, and, consequently, always commands a higher price, and this rule applies to all the fruits. Again, we should select such varieties as are known to produce large crops of smooth, handsome fruit. In market you will find size and color of more value than flavor, for where you see one person buy for flavor alone, you will find ten who are governed entirely by appearances, and who will buy the large high-colored fruit every time, and, after all, this is a very good criterion to judge by, for, as a rule, the highest colored fruit is the finest grained and best flavored.

A great deal remains to be said about gathering, packing, and marketing fruit, but this would open up a wide subject, which, although to me very interesting, might prove tiresome if entered upon at this time, so I will reserve that portion of my subject for a future meeting.

The subject being before the Board for discussion:

Dr. ROLAND. I do not intend to speak upon the general subject of the essay; I think it is an admirable one. I simply rise for the purpose of asking a question of the essayist. If I understood him correctly, he said that the late varieties of fruits were the best for preserving.

Mr. HIESTER. I know of no variety of any fruit better than the late variety for preserving. For instance, peaches. The early varieties easily break up, while the later varieties are harder in flesh, and then can be canned without breaking. The strawberry may be an exception to this; but the Wilson, one of the earliest, is about as bad a berry as you can get, but it is the only exception I know.

Dr. ROLAND. Do not the early varieties mature better than the late varieties?

Mr. HIESTER. I think not. I find in my experience, I cannot sell in early trade for preserving and canning. That has been my experience for the last eight or ten years. The Crawford peaches are canned and preserved, and they wait for the Bartlett, Howell, and Duchess, for preserving or canning—the Howell, I believe, taking the lead, because a firmer pear than the Bartlett, and so on through the list.

Mr. HERR. There is no one subject, perhaps, brought up before this Board, in which I am more of an enthusiast than that of fruit culture; and while I agree in the main with the essayist, I think the essay is calculated to make us run into fruit culture too largely. It is said, as we cannot compete with the western part of the country in the raising of grain, that necessarily we must come into fruit culture. Now, the thought has arisen in my mind, what would be the result if the broad grain fields were turned into fruit orchards? I believe if one acre out of fifty were devoted to fruit culture, such as he describes, it would be in as great proportion as we could profitably raise. Every locality in this State is not as favorable to fruit growing and marketing fruit as Dauphin county—not every market is as good as that of Harrisburg—so that the profits of fruit culture will not average as great as the essayist would make it. The larger part of the essay is very valuable and full of instruction.

Mr. KELLER. I have no doubt that the gentleman from Dauphin could answer the gentleman from Clinton, that it is not likely we will plant all our broad acres with fruit trees. We must have something else, At the same time, if we do put a large quantity of ground in fruit, fruit will become somewhat cheaper, of course, and it will be consumed by everybody, even the poor. If the fruit is so low in price that the poor man can use it—if you can raise ten bushels of fruit to one now—you will have more money in the end. So we can hardly raise too much fruit. If we have it cheap, everybody can use it.

Mr. HIESTER. That essay is incomplete. It was so lengthy I did not venture to add any more. I left out the gathering and marketing. I think I can show how every farmer in Pennsylvania can have plenty of fruit, and yet there will be a demand. We generally have to market it fresh. Every year there is an increased demand for dried and canned fruit. Both are now being used on ship-board instead of sea biscuit and salt meat. With the increased demand thus made you will find that in Pennsylvania, if every farm were planted with fruit, it would be more profitable than grain, if attended to. There is no use in a slovenly farmer undertaking to grow fruit, because if he does he will lose; but with industry, care, and skill, every farmer in Pennsylvania could raise fruit with profit.

Secretary EDGE. Can the eastern farmer compete with the California farmer in dried fruit?

Mr. HIESTER. I think we can. I think we can get as good fruit as the California farmer ever had—not so large, but all the California fruit I have ever seen was not as good as our own.

Mr. HERR. The profits are represented as they are now; but if, at the suggestion of the essayist, we were to plant much more largely, I do not mean to say it would not be as profitable as grain or some other products that we raise; but, in the opinion of the essayist, would the aggregate results prove equal to a fair interest on one or two hundred dollars per acre?

Mr. **BEEBE.** Take the position that grain raising is beyond our reach, and we cannot compete with the west and their agricultural resources, would not the same result be attained in regard to fruit? Is not the fertility of soil and variety of climate just as well adapted to success in the West, when pushed to the same extent, as in our State, in fruit growing and in grain growing? Now, I am reminded that the Lake Shore has been regarded as the place for grape culture and wine making, and yet notwithstanding that claim, a large company have already transferred their place from the Lake Shore to Missouri, and advertised their lands for sale upon the shores of Lake Erie. The size and abundance of the fruit from the West seem to lead to the same conclusion, that with the same rates of freight for transportation, and the facilities for transportation, we are in a position to be successfully competed with just as much in fruit, when the development is made, as we are now in regard to grain.

Dr. **ROLAND.** It strikes me there is always a market for fruit, and that there always will be a market for it; but fruit very often is not thrown on the market, because the producer or the raiser of it may think it does not command a sufficiently high price, and he is not going to bother taking it to market to sell at a moderate rate. The independent farmer, the man who is able to do without raising these fruits, is very much, it strikes me, like the woman who takes our chickens and eggs to market, and puts her price upon them, and says if she can't get it, she will take them home and eat them herself. So with the producers, if they cannot get their prices, they would sooner see the fruit rot upon the ground than take it to market. The difficulty lies in not inducing them to do this.

Mr. **MUSSELMAN.** I understand the gentleman prefers late varieties for canning. Is it not because the early varieties are not in demand for canning? You can dispose of the early varieties at ready sale and higher prices.

Mr. **HIESTER.** I have not found that to be the case. All my early fruit I sold by the single basket or half-peck, while the late fruit I sold in any quantity. Take it in the market, all our fruit is sold by the half-peck; and as soon as the late varieties come in they buy them by the basket, for putting up, because, with peaches especially, the late varieties are far better, and in pears the late varieties are better. They do not can apples, or take the trouble to dry them, or they can very few. I do not think I have a single customer in the market who buys apples for canning.

Mr. **BEEBE.** We can in western Pennsylvania.

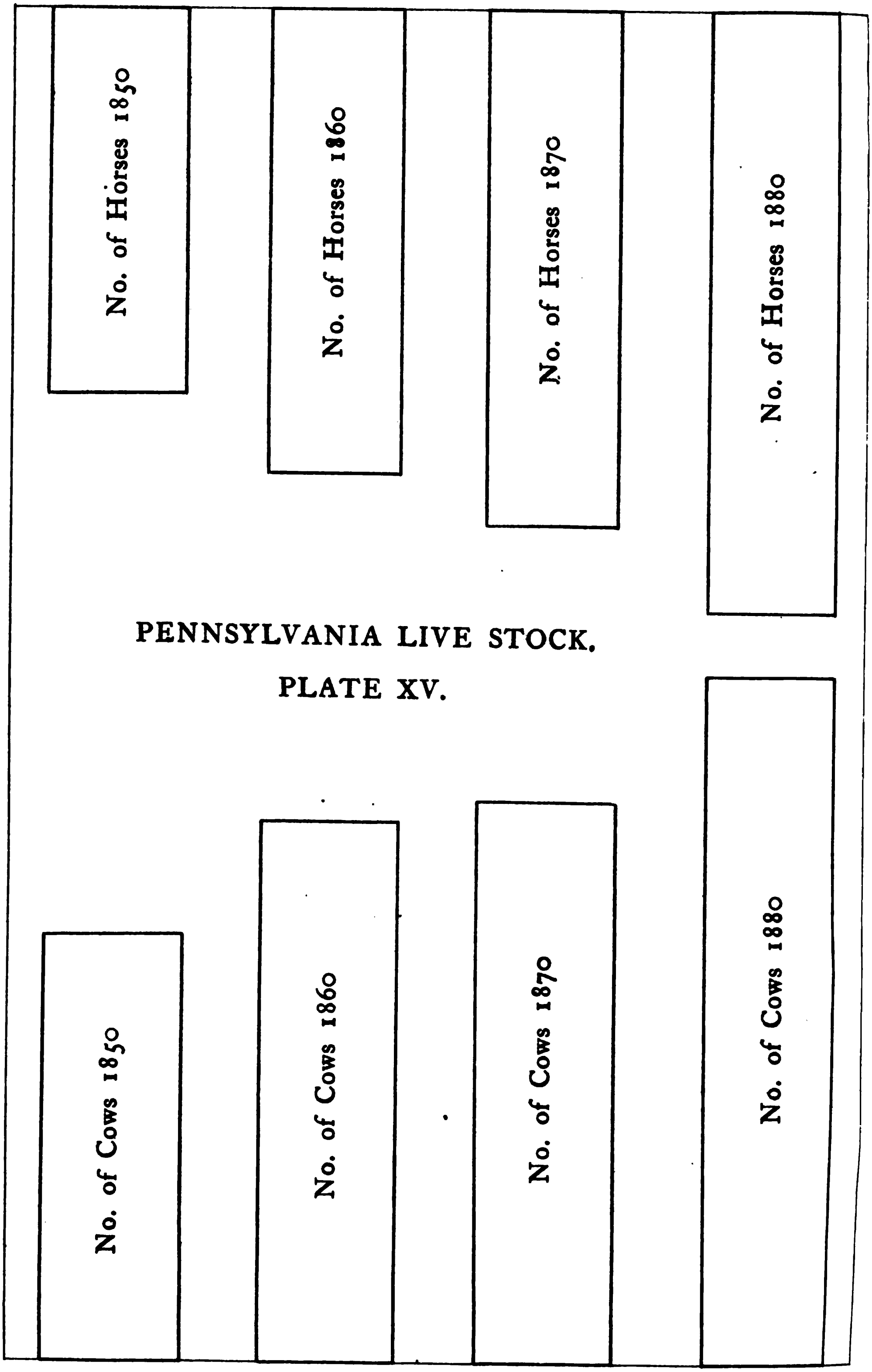
Mr. **HERR.** Is not the reason that later fruits are used for canning attributable to the fact that canned fruit generally keeps better after the heat of the season is over? They are canned late in the season, as people can can more successfully then.

I would like to see this subject carried further. I do not know that we have ever had an essay before this on the best methods of preserving fruits—I mean in the green state—by fruit raisers. That is something we want all over the country. We want to be able to dispose of our fruits to the best advantage. I say, in regard to the surplus of fruit, that I have never seen a time when we had too many peaches, or when they did not bring a reasonably good price.

Prof. **MEEHAN.** The remarks of the essayist seem to bring up very closely the profit of small fruits. I confess that when he commenced to read his paper his introductory remarks led to the same thoughts in my mind that passed through Mr. Herr's; the question of profits seemed to be

PENNSYLVANIA LIVE STOCK.

PLATE XV.



involved, but as the essayist proceeded he seemed to take up the more practical questions of fruit culture, the way to grow them, the best way of producing them, and the best varieties to grow. But, after all, I cannot separate the question of fruit growing from one of profit. Mr. Herr has said that persons are induced to go into fruit culture for profit, and very often to their sad experience. The essayist said in Pennsylvania, in consequence of the discriminating tariff of the railroad companies in the bringing of wheat from the west to the east, we have found the grain crops getting to be unprofitable; and, as Mr. Herr states, on that account they are recommended to go into fruit culture. But these persons no sooner go into fruit culture than their troubles are added to immensely. They have to give bonuses to carry fruit into the market, and here is a source of trouble. The railroad companies have some good reason for this discrimination. They say, for instance in Delaware, to carry fruit to market they have to provide immense quantities of rolling stock that can be used only in peach time—that are left in the yards afterwards without any use for them, requiring an immense amount of capital for which they get no interest. Then, supposing they have a large amount of rolling stock to carry the crop into market one year, the next year there may be a failing crop, and the cars be of no use to them except for another year. The fruit growers find themselves unable to carry out their contracts with the railroad company. They say they will have so many car-loads of strawberries and other fruits, yet a late frost steps in, and they are unable to carry out their contracts; after all the railroad company's arrangements are made, and after preparing stock, there is nothing comparatively to go to market. So if you take this question of growers and railroad companies you can consider what your troubles would be in the general field. I know persons have failed completely on account of the difficulty at certain times of getting their fruit to market. If it be true in grain growing, and the inability to grow grain with profit on account of the railroad discriminations, would we not fail in the raising of fruit from the very same cause? Therefore the question of marketing is a very important one. There are two sides. Railroad men carry on business to make profits for the stockholders—they say to accommodate farmers and carry grain for one person as well as another—but practically they have to look at the question of profit. It is impossible to separate that from the question.

The one possible remedy that is entertained is for the States or for the United States to run railroads themselves just as they run the post-office. Then if they carry freight one thousand miles as low as one mile for everybody who wished to have it carried, a few persons wishing to get their grain to market would have as fair show as others. But on the other hand political influence and patronage would extend to almost every person through the Government, by the Government controlling hundreds and thousands of railroads. The other question is, whether to not submit to these ills that we have as well as we can, or so long as we have these railroads anxious to earn dividends for their stockholders. One important subject to be looked at in the meantime is, as near as possible, to get the best and most advantageous terms we can from the railroads.

I think the great question to be considered in going into the fruit business is getting of the fruit to market. That is one of the most important questions you have to deal with in connection with the profits of fruit-growing.

Secretary **EDGE.** Does Mr. Hiester think he can ship to Philadelphia with profit?

Mr. **HIESTER.** I keep away from Philadelphia. I think the plan is to aim at the mining towns. I do not think there would be any trouble about this generation having a market for all the fruit that they will grow. The generations to come can take care of themselves.

Mr. MUSSELMAN. I think this fruit-raising must be confined to near cities and markets. Where we live it would not pay. We have one railroad, but you understand the working of railroads. I have given apples away by the wagon load, or sold them for a quarter of a dollar a bushel. Therefore, I conclude, these things must be confined to where there are markets. Of course a gentleman situated like Mr. Edge, or Mr. Herr, or Mr. Hiester, can go into the market. Until we know where we can sell, I believe fruit-raising for profit is out of the question.

Mr. HERR. Could not the best of pears be raised in Somerset county, and especially to market at a big profit? Choice pears always command big prices, even in our large cities.

Mr. MUSSELMAN. I think we can raise nearly all the varieties of fruit that can be raised in Pennsylvania, yet peaches that are sold at half a dollar a bushel at home, by the time we get them to a market, they cost us two dollars. So by the time we raise them, and get them to market, we cannot compete with the people who live close to the market.

Mr. BEEBE. Can you successfully compete with the pear blight up there?

Mr. MUSSELMAN. No, sir; we have the pear blight.

Dr. BARNES. There is an affirmative and a negative side. Raising fruit is a very nice thing when you have a profitable market; but not so when you raise it so abundantly, you do not know what to do with it. In connection with the part of the essay in regard to the successful raising of fruit, it depends a good deal upon the circumstances and conditions surrounding us in certain seasons of the year. As to canning, when the early varieties present themselves, we find plenty of fruit, and everybody using it for present consumption. It is abundant, and coming in from every side. In course of time, these fruits begin to fall of in quantity, and we are coming down to finer points, and we have lesser varieties to act upon. The fruits are running out—winter is approaching—can we not get some to preserve, and some to can? Then, again, with fruit later in the year, there is more chance for selection, and, perhaps, that is one reason they can be used for canning purposes.

Prof. LEFFMANN. As to the kind of fruits best to preserve, it seems to me that the remarks of the gentleman who has just taken his seat are not altogether correct, because a large amount of canning is by companies who make a business of it. They do not wait until late in the season to make their arrangements for it, but probably take the fruits which they find, and are best suited. In regard to the remark of Professor Meehan, with reference to the uncertainty of railroad facilities—that they have to provide extra arrangements for their shipments—that is probably no more true of fruit than any other product. Railroad companies can never be sure of their freight, and you never can be sure of your crop—both may vary, and that very suddenly—so that the company may suffer from the loss of freight, or the failure to take it. The point I want to make is: I do not think the transportation of fruit is more uncertain than any other product. One company is suffering from the fact, not that the product is not as plenty as ever, but people do not take it. This is illustrated in the sale of coal. The company suffer from the want of demand, but not any more in reference to fruit, I think, then anything else.

THE LUNG PLAGUE,

(*Pleuro-Pneumonia Contagiosa.*)

By THE SPECIAL AGENT OF THE GOVERNOR.

This report, though not strictly in the line of the work of the Board of Agriculture, is here inserted at the request of a number of those interested in the work, and to supply a demand for information relative to the disease. Of the general nature and character of the disease, little or nothing new has been discovered since the former report in 1879, and hence, with a few additions and alterations necessary to bring the report up to date, it is mainly a repetition of the former one. Wherever the work of the past three years and nine months has made changes necessary they have been made.

Name, History, Nature, and Symptoms of the Disease.

It is unfortunate that the common name—pleuro-pneumonia—should have been selected to designate this disease. In the debates in the Legislature, during the passage of the act, in the daily correspondence of the Board of Agriculture, in the agricultural and daily papers, and even in some scientific journals, this name has caused much confusion and needless dispute. By many it has been confounded with common or sparodic pneumonia, which is not contagious, and which may, in all cases, be traced to exposure, neglect, or to a violation of some law of nature. This common pneumonia will *originate* in a locality, while the lung plague, called pleuro-pneumonia, has never yet been proven to thus originate in any locality in this country; but if its cause can be traced at all it is found to have proceeded from contagion conveyed by another animal, or from the excretion from the bowels, kidneys, skin, or lungs of another animal. No amount of neglect or bad treatment will develop this disease, and we think it may be assured that no bad treatment, or abuse, will develop a contagious disease of this kind. It is now too late to hope to effect a change of name, but many have been suggested as not only more appropriate, but also more satisfactory to the general reader, and average stock breeder. Prof. Hertwig, of Berlin, gave it the name of *Lungenseuche;* Haller called it *Vieh-seuch;* Cathbert styled it *Peri-pneumonia;* in Italy it is known as *Pulmonæ de bovini.* In fact, in different countries, and at different times, it has had names of all lengths and styles, from the "Murie" of Brougelat to the "*Peri-pneumonia exsudation enzootica et contojiosa*" of Gicleu. Throwing aside all technicalities and form, we think that the plain name, "Contagious lung plague" will best suit the case.

When, where, or how, this disease first originated (for it must have had an origin) no one can say with any great degree of certainty, Delafond quotes Aristotle as writing of his time, that "The cattle which live in herds are subject to a malady, during which the breathing becomes hot and frequent. The ears droop, and they cannot eat. They die rapidly, and on opening them the lungs are found spoiled." The history of the disease in this country may be thus briefly summed up.

The first notice of its existence was in a cow imported from Germany in 1843, and landed in Brooklyn, and it has been claimed that since then this locality has never been free from the disease, and now forms the main center of contagion with which the New York authorities have to contend. In 1847 it was brought from England into New Jersey, and in 1850 was again brought into New York by a cow imported from Europe. It was prevalent in Camden and Gloucester counties, New Jersey, in 1859, and in 1860 broke out among the dairies near Philadelphia. In 1861 it broke out in Delaware county. The Philadelphia cow market served as a center, and the contagion gradually spread to surrounding counties, and soon Baltimore and the surrounding district was affected, and the disease now threatens to obtain a foothold in southern counties of our State from this center of contagion.

The dairyman who has lost from fifty to seventy-five per cent. of his stock, has very little sympathy with any one who will claim that the disease is not contagious. Finding a newly-purchased animal sick with an, to him, unknown complaint, which defies all treatment, and soon runs its course in the first animal, and sooner or later attacking every animal of the herd, in some cases proving fatal in more than fifty per cent. of the attacks, and leaving those which *apparently* recover, in many cases, in a condition worse than useless, he discards all fine theories, all fine drawn arguments of medical men, and assumes that he has to deal with a contagious disease over which he can exercise little or no control.

When, as has been the case in this State since the passage of the law of last winter, he sees seven of his animals all at the same time affected with the same symptoms, each passing through exactly the same stages of disease, and when killed and opened each presenting exactly the same post mortem evidence of the same disease, his common sense teaches him that the sick contaminate the well, and that the disease will, in this way, not only spread from animal to animal, but also from herd to herd, until the whole country will be infected.

The fact that inoculation will produce, in a mild form, the symptoms of the disease, and that when a country becomes thoroughly impregnated with the disease is a last resort, is, perhaps, sufficient proof of the contagious nature of the disease, but as further proof we quote as follows from our best authorities on the subject of this and other diseases:

Prof. Williams, of Edinburg, in "The Principles and Practice of Veterinary Medicine," page 139, when treating of pleuro-pneumonia as contagious, says it is "A contagious febrile disease peculiar to horned cattle, having an incubative period of from two to three weeks to as many months, at the end of which local complications arise in the form of extensive inflammatory exudations within the substance of the lungs and upon the surface of the pleura, finally resulting in consolidation of the pleural surfaces."

In his "Farmers' Veterinary Adviser," Prof. Law, in treating of this disease, says, (page 14-15,) it is—

"A specific contagious fever of cattle, with extensive exudations into the chest and lungs. The period of latency of the poison in the system is from four to six weeks, and in exceptional cases perhaps two or three months, or as short as ten days."

In his "Manual of Veterinary and Sanitary Science and Police," Fleming says, (Vol. I, page 408:) "This pleuro-pneumonia of cattle is a specific and contagious disease peculiar to bovine animals, and of a sub-acute or chronic character. It usually appears as an epizootic or enzootic malady, and in the subtilty of its contagion, its general diffusion, and the great fatality attending it, it is a most serious scourge. In every country in which it has appeared it has caused an immense destruction."

In his work on "The Diseases of Live Stock," Dr. Teller styles pleuro-pneumonia "a contagious fever of cattle, accompanied by great prostration, together with local inflammation, and other diseased changes in the lungs and their envelops. This is no doubt a specific blood poison."

In his "Four Bovine Scourges," Prof. Walley, of Edinburg, says: "Zymotic pleuro-pneumonia is an insidious exudative zymotic disease, due to a specific poison or ferment, peculiar to the ox, and having its local manifestation concentrated in the lungs and pleura. No age, breed, or class, neither sex of bovine species enjoy immunity from the effects of the virus of this disease. Zymotic pleuro-pneumonia has a well-defined, though extremely uncertain, incubatory stage, and is alike contagious (by actual cohabitation) and infectious."

In his report to the National Government, (illustrated edition, page 29,) Prof. Gamgee says: "Not only have theories in relation to the cause or combination of causes which may lead to the development of pleuro-pneumonia been unsatisfactory, but opportunities are constantly presenting themselves to test the fact that privations, over-crowding, impure food, and water, &c., singly or combined, may help, but never induce the disease which presents the characteristics of the one referred to in this report. The malady may be produced at will, by placing an animal suffering from it among healthy ones, and by direct inoculation. These are the only methods by which it is propagated."

In his official report, Hon. W. C. Le Duc, National Commissioner of Agriculture, states that "pleuro-pneumonia is a malignant contagious fever, to which, as far as known, cattle only are liable, and in them is accompanied by inflammation and other diseased conditions of the lungs and their membranes, together with great prostration of the entire system. It proceeds from a poisoned condition of the blood. How, when, or where this poison was first generated it is impossible to tell. Nor is it less difficult to determine its specific nature. So far as reliable information has yet reached, it is never generated spontaneously, but depends entirely on the introduction of a virus or contagion into the system of a healthy animal. A single animal so infected infects the herd; the herd, sub-divided and scattered, infects other herds, until in time large areas of country have been visited and devastated by the fearful scourge."

Symptoms.

In its earlier stages it is very difficult to detect this disease, but in all cases where animals have been recently purchased, or where the affection is plainly one of the lungs, it is safest to assume that it is the so-called pleuro-pneumonia, and at once isolate the animal. If it is the disease it will soon make itself known by its after symptoms; if it is not, no harm is done beyond the small amount of additional trouble caused by the isolation.

In its incubating or first stage the disease is not accompanied by that intense inflammation which afterwards is manifest; yet there is in all cases a slight increase in the temperature, as shown by a thermometer inserted in the rectum. This latter test alone will not prove satisfactory, because a rise in temperature may proceed from other diseases and other causes than pleuro-pneumonia; and, as a rule, our surgeons place little reliance upon this test, except when, in addition to other symptoms of a more decided nature, it may be taken as cumulative evidence. While owing to peculiarities in constitution, different animals are affected (in the primary stages) to different degrees and in different ways, we merely take the following as covering a large majority of cases.

In all cases there is more or less shivering, which, in many cases being slight, may pass unnoticed, or which may result from any other cause producing fever. In milking cows, one of the primary results of infection is often an increase in the amount of milk, which naturally results from the unusual excitement of the nervous system, but in a very short time this passes off, and instead of giving a large pail full, as at the previous milking, the amount will often quickly fall off to less than one quart. The animal shows an evident disinclination to associate with the others, and is usually to be found in a fence corner or corner of the yard, by itself. If the herd are accustomed (as is the case with milk cows) to come up to the buildings at certain hours, the infected animal will usually linger behind the others, or will refuse to come in at all. In such cases, if a ditch is to be crossed, it will usually be found upon the bank furthest from the buildings. The pulse is much increased and the respiration irregular and much disturbed. The animal stands with its back arched, and on applying the ear closely on the diseased side, an unusual and abnormal sound may be detected, similar to that caused by the friction of two thin pieces of dry paper or partially dried hide.

As the disease progresses, the surface of the body and partially the extremities become cold; the mucous membrane at the external orifices of the body becomes hot, and is indicative of the inflammation within; the bowels in a majority of cases become constipated, but in some cases which have come under our notice the reverse has been the case; the skin becomes dry, the coat stares, shivering fits set in, the breathing becomes more hurried, and the pulse reaches eighty-five to ninety per minute, and an increased harshness or grating is heard in the diseased lung and bronchial tubes. A peculiar dry and husky cough sets in which is heard in no other disease, and which, having once been heard, although it cannot be described, is at once recognized by the surgeons or by the stock-owner who has been so unfortunate as to have the disease in his herd. In the concluding stages all these symptoms are very much intensified; the cough becomes more frequent, and from its increased intensity and the weakened condition of the animal, evidently is more painful, and is usually accompanied by a peculiar grunt or moan, indicative of intense pain. If not so before the bowels become constipated, the skin is more tightly drawn over the protuberances of the body, flesh is lost rapidly, much more so than can be accounted for by the mere abstinence from food; the pulse becomes very irregular, and the animal seeks release from the pain and difficulty of breathing by standing with its elbows thrown out from the chest, and intense pain is shown by a pressure on either side of the spine, just back of the shoulders. In the later stages of the disease there is usually a peculiar twitching of the nostrils and corners of the mouth, the exhaled breath is very offensive, and is plainly indicative of the corruption which exists within.

The veterinary surgeon of the Board of Agriculture gives the following summary of the physical symptoms which, after a very little practice, has enabled those who have the disease in their herds, *by a daily examination*, to select the infected animals and at once isolate them, and thus save much loss to themselves and expense to the State:

"By placing your ear at the bottom of the neck, a loud rushing sound of air is heard in the trachæ and bronchial tubes. The same sounds are heard at the top and sides of the chest, just behind the shoulder blade. Below and back of these parts no sound at all is heard, showing that the lungs are consolidated by the fibrous exudations which are being constantly thrown out. At the commencement of an attack, we can often notice what is called the 'friction sound,' from the rubbing together of the thickened and rough membranes during respiration. Should one lung only be affected, the respiratory murmur in the healthy lung is much increased, in consequence of its having to perform double duty. When both lungs are diseased, we expect peculiar effects and sounds, according to the intensity and extent of the lesions. There is increased resonance on percussing the healthy lung, while over the diseased part, a dull, heavy sound is elicited."

In all cases, a post mortem examination should be made which will indicate some or all of the following conditions, as given by the surgeon of the Board of Agriculture:

"On exposing the thoracic viscera, one of the first indications of epizootic pleuro-pneumonia is the escape of large quantities of fluid from the cavity. This fluid mostly contains large patches of yellow, plastic, or coaguable lymph floating about in it. As a result of the inflammation which has been going on, we find that this plastic lymph has fastened the lungs to the ribs, and formed what we know as 'false membranes,' or 'adventitious tissue.' These false membranes are sometimes fastened to the diaphragm and heart, as well as the sides of the chest. The lungs are found to be exceedingly heavy, often weighing from fifty to seventy-five, and even one hundred pounds, sink in water, and instead of the bright salmon color of health, we observe a dirty gray color, mottled, and having the appearance of marble. The surfaces are rough and thickened, and the lung substance hard and firm. The bronchial tubes are frequently found entirely blocked up with fibrinous deposits, thus shutting off the contact of air with the blood, and producing death by suffocation.

This exclusion of the atmospheric air from the lungs, accounts for the dark purplish color of the transuded blood corpuscles, and fibrinous exudations. In some of the more advanced cases, abscesses are found in the substance of the lungs, which either discharge through the bronchial tubes, undergo degeneration, (the *amyloid* most frequently,) or else the discharge takes place within the chest, which gives rise to the *amphoric rale*. All the other organs of the body are (as a rule) found to be in a state of health."

Legislation.

For several years previous to 1879 there had been a growing desire upon the part of the stock breeders and stock owners of the State, that, if possible, something might be done to prevent, or, at least, mitigate the losses they had each year experienced from the disease known as contagious pleuro-pneumonia. At meetings of our farm clubs, county agricultural societies and granges, the subject had been discussed and committees appointed to take the subject into consideration and report.

The immense loss which must result from the infection of the large herds of the West and Southwest was plainly pointed out. It was shown that England, with only six million animals, had lost more than $500,000,000 by this disease since its introduction from Holland, and that, in the same ratio, the introduction of the disease among our twenty-eight million cattle, would cause a loss of $2,000,000,000 in an equal time. That in our own State, the loss would, in a short time, seriously impair an important interest, and would prove eminently more fatal in the West, where all interests are more or less intimately connected with that of stock raising, and where all interests thrive or languish in sympathy with it. The disease had insidiously crept from dairy to dairy, from farm to farm, and from one stock-yard to another, until four of the leading dairy counties of the eastern portion of our State were infected. In these counties the entrance of the disease into a herd was considered as tantamount to a loss of from twenty to fifty per cent., and sometimes exceeded even the latter rate. Dairies were broken up, the business abandoned, and, in many cases, the surviving animals sold and scattered, thus forming centers of further contagion. All practical men admitted the presence of the disease. Our agricultural papers discussed its spread and its probable results. Our veterinary surgeons had, in a measure, become familiar with it, and most of them recognized the fact that treatment was of but little avail. With the disease a matter of comment in our daily papers, it was not at all surprising that the British Government, whose farmers had lost millions by this and similar imported diseases, and had spent immense sums in stamping out this very disease, should direct its attention to the presence of the disease here, and the possibility of the infection being conveyed by cattle imported from this country into English ports. The agents of the British Government, accompanied by competent veterinary surgeons, who were familiar with the disease during its ravages in England, starting from Canada, found evidences of its presence in the past, in all the Atlantic States, from Massachusetts to Virginia, and, reporting its presence to the home Government, a quarantine was ordered on all American cattle. They failed to recognize the fact that the cattle thus imported did not come from infected districts, and that they did not come in contact with infected cattle; but, finding *supposed* cases of contagious lung plague (pleuro-pneumonia) in a cargo of the Ontario, at once issued the edict which practically stopped the importation of live American cattle, at least, for a time. It is now rendered very probable, if not almost certain, that the stock in the Ontario were only affected with common or sporadic pneumonia, caused by injuries sustained by the vessel during a severe storm, and the consequent drenching with cold sea water, which the cattle afterwards sustained; yet this furnished the needed excuse, and had not this been found, another would have soon taken its place. Whether this action of the British Government was due to a desire to protect British cattle or arose from a fear of competition, rather than contagion, it is not for us to discuss, but such are the facts of the case.

A number of our best veterinary surgeons and most enterprising cattle breeders and dealers had, for a long time, been anxious that our national Government should quarantine *all* imported cattle; and, if possible, by this inexpensive precaution, prevent the introduction among our stock the much feared rinderpest, foot and mouth disease, or the many other contagious diseases to which the horned stock of Europe are liable; but their advice and request has not met with appreciative action on the part of the general Government, until after the passage of such an act would assume the appearance of retaliation, and, of course, came too late to have any effect upon the disease which we have under consideration.

By legislative action, the State of Massachusetts had, at least four years before, not only admitted the existence of the disease, but had, also, by legislation, decreed an attempt to eradicate it by what has been styled the "stamping out process," and, after a few years of active work, the sought for result had been attained at a cost of $68,000, and the State, except from cases brought in from neighboring States, has been pronounced free from the disease. Connecticut, New York, and New Jersey, by similar legislative enactments, had also recognized the disease in an official manner, and had made appropriations and passed laws necessary for its attempted eradication, on a plan similar to that adopted by Massachusetts, and had asked the coöperation of Pennsylvania in a common and concerted attempt to accomplish this purpose, and, if possible, prevent the further progress of the disease westward.

At this stage of the proceedings the worst injury which could be inflicted upon our export trade in live stock had its effect, and the shipments in live cattle had practically stopped on account of quarantine regulations. The farmers of our State were aroused to the imminent danger resulting from the permanent location of the disease in this country. Several States, for mutual help and protection, had joined in an endeavor to stay the pest, and the assistance of our State was asked.

Recognizing all these facts, and being in possession of many more which might be enumerated, a meeting of dairymen of Delaware, Montgomery, and adjoining counties, held in Philadelphia early in March, 1819, appointed a committee to wait upon the Secretary of the Pennsylvania Board of Agriculture, and urge the importance of legislative action. The veterinary surgeon of the Board, with this committee, visited herds reported to be infected. Veterinary surgeons who had had years of experience with the disease in England were called in, post-mortem examinations were made, and the existence of the disease established beyond a reasonable doubt.

The Legislature being then in session, the Secretary of the Board of Agriculture laid all the evidence before the joint Committee of Agriculture of both Houses, consisting, on the part of the Senate, of Senators St. Clair, Seamans, Kauffman, Roberts, Craig, Ross, and Beidelman, and on the part of the House of Representatives, of Messrs. Kincaid, Matlack, Greenawalt, Magill, Ackerly, Miller, Stephens, Hill, McConnell, Landis, Walker, Burton, Eberly, Fullerton, Lowing, Nichols, Bowman, Hallowell, Schaeffer, Davis, Fabel, Gammell, Newbaker, Eldred, and Morris.

After discussion, this committee decided that it would be proper that the State should adopt a line of precautionary and preventive action not only for the benefit of its own citizens, but also out of respect to the action of adjoining States, and a sub-committee was appointed to consult with the Governor, and, if deemed expedient, prepare a draft of an act providing for the desired action. After consultation, the following resolution was offered by Senator Kauffman, and adopted by both branches of the Legislature:

"WHEREAS, The States of New York and New Jersey, by recently enacted laws to prevent the dissemination among live stock of the disease known as pleuro-pneumonia, now invite this State, by a concert of action, to assist them to eradicate this contagion; therefore,

"*Resolved by the Senate*,(if the House of Representatives concur,) That the Governor be and he is hereby authorized to take such preliminary action as may be necessary to prevent its further spread."

This resolution was approved by the Governor March 27, 1879.

At the same time the draft of the act, as adopted by the committee, was introduced by Senator Kauffman, and after amendment, passed both branches, and was approved by the Governor May 1, 1879. The act is as follows:

AN ACT

To prevent the spread of contagious or infectious pleuro-pneumonia among the cattle in this State.

SECTION 1. *Be it enacted, &c.*, That whenever it shall be brought to the notice of the Governor of this State that the disease known as contagious or infectious pleuro-pneumonia exists among the cattle in any of the counties in this State, it shall be his duty to take measures to promptly suppress the disease and prevent it from spreading.

SECTION 2. That for such purposes, the Governor shall have power and he is hereby authorized to issue his proclamation, stating that the said infectious or contagious disease exists in any county or counties of the State, and warning all persons to seclude all animals in their possession that are affected with such disease or have been exposed to the infection or contagion thereof, and ordering all persons to take such precautions against the spreading of such disease as the nature thereof may in his judgment render necessary or expedient; to order that any premises, farm, or farms where such disease exists or has existed to be put in quarantine, so that no domestic animal be removed from said places so quarantined, and to prescribe such regulations as he may judge necessary or expedient to prevent infection or contagion being communicated in any way from the places so quarantined; to call upon all sheriffs and deputy sheriffs to carry out and enforce the provisions of such proclamations, orders, and regulations, and it shall be the duty of all the sheriffs and deputy sheriffs to obey and observe all orders and instructions which they may receive from the Governor in the premises; to employ such and so many medical and veterinary practitioners and such other persons as he may from time to time deem necessary to assist him in performing his duty as set forth in the first section of this act, and to fix their compensation; to order all or any animals coming into the State to be detained at any place or places for the purpose of inspection and examination; to prescribe regulations for the destruction of animals affected with the said infectious or contagious disease, and for the proper disposition of their hides and carcasses, and of all objects which might convey infection or contagion, (provided that no animal shall be destroyed unless first examined by a medical or veterinary practitioner in the employ of the Governor as aforesaid;) to prescribe regulations for the disinfection of all premises, buildings, and railway cars, and of objects from or by which infection or contagion may take place or be conveyed; to alter and modify, from time to time, as he may deem expedient, the terms of all such proclamations, orders, and regulations, and to cancel or withdraw the same at any time.

SECTION 3. That all the necessary expenses incurred under the direction or by authority of the Governor in carrying out the provisions of this act, shall be paid by the treasurer upon the warrant of the Auditor General, on being certified as correct by the Governor: *Provided*, That animals coming from a neighboring State that have passed a veterinary examination in said State, and have been quarantined and discharged, shall not be subject to the provisions of this act.

During the passage of this act the existence of the disease in the State had been doubted. Hence, immediately after its approval, His Excellency Governor Hoyt appointed a commission to "examine and determine whether infectious or contagious pleuro-pneumonia exists among cattle in any county or counties of this Commonwealth, and report the same to the Governor without unnecessary delay." This commission consists of Hon. Samuel Butler and Hon. H. C. Greenawalt, on the part of the Legislature; Thomas J. Edge, and C. B. Michener, on the part of the Board of Agriculture; Hon. John C. Morris and George Bright, on the part of the Pennsylvania Agricultural Society; and George S. Garrett, on the part of the dairymen of Philadelphia and vicinity. At the first meeting of this commission, Hon. John C. Morris was elected president, and Thomas J. Edge secretary.

At a meeting held in Philadelphia, May 16, a large number of practical dairymen and veterinary surgeons were examined, and their evidence taken down by a stenographic reporter, and is now on file in the office of the Board of Agriculture. As a result of this meeting Messrs. Morris, Butler, and Greenawalt were appointed a committee to report to Governor Hoyt, on behalf of the commission, that the disease did exist in, at least, two counties in the State, and that the decision of the commission was unanimous.

Under authority of the act before quoted and based upon the report of the commission, his Excellency Governor Hoyt appointed a special agent to take charge of the matter, to whom he issued the following commission:

"It having been ascertained that an infectious and contagious disease of neat cattle, known as pleuro-pneumonia, has been brought into and exists in certain counties of this State, I hereby appoint you as my assistant to carry out the provisions of the acts of 1866 and 1879, for the prevention of the spread of this disease. As such assistant you are hereby authorized:

"To prohibit the movement of cattle within the infected districts, except on license from yourself, after skilled veterinary examination, under your direction.

"To order all owners of cattle, their agents, employés, or servants, and all veterinary surgeons, to report forthwith to you all cases of disease by them suspected to be contagious; and when such notification is received, you are directed to have the case examined, and to cause such animals as are found to be infected with said disease to be quarantined, as also all cattle which have been exposed to the infection or contagion of said disease, or are located in an infected district; but you may, in your discretion, permit such animals to be slaughtered on the premises, and the carcasses to be disposed of as meat, if, upon examination, they shall be found fit for such use.

"You may prohibit and prevent all persons not employed in the care of cattle therein, kept from entering any infected premises. You may likewise prevent all persons so employed in the care of the animals, from going into stables, yards, or premises where cattle are kept, other than those in which they are employed. You may cause all clothing of persons engaged in the care, slaughtering, or rendering of diseased or exposed animals, or in any employment which brings them in contact with such diseased animals, to be disinfected before they leave the premises where such animals are kept. You may prevent the manure, forage, and litter, upon infected premises from being removed therefrom; and you may cause such disposition to be made thereof as will, in your judgment, best prevent the spread of the disease. You may cause the buildings, yards, and premises, in which the disease exists, or has existed, to be thoroughly disinfected.

"You are further directed, whenever the slaughter of diseased animals is found necessary, to certify the value of the animal or animals so slaughtered, at the time of slaughter, taking into account their condition and circumstances, and to deliver to their owner or owners, when requested, a duplicate of such certificate. Whenever any owner of such cattle, or his agent or servant, has willfully or knowingly withheld, or allowed to be withheld, notice of the existence of said disease upon his premises, or among his cattle, you will not make such certificate.

"You are also directed to take such measures as you may deem necessary to disinfect all cars or vehicles or movable articles by which contagion is likely to be transmitted. You will also take such measures as shall insure the registry of cattle introduced into any premises on which said disease has existed, and to keep such cattle under supervision for a period of three months after the removal of the diseased animal and the subsequent disinfection of said premises.

"You are further authorized and empowered to incur such expenses in carrying out the provisions of the foregoing orders as may, in your judgment, appear necessary, and see to it that all bills for such expenses be transmitted to this department only through yourself, after you have approved the same in writing.

HENRY M. HOYT,
Governor.

"Attest: J. R. MCAFFEE,
Deputy Secretary of the Commonwealth."

The agent of the Governor issued the following notice:

To all owners of cattle, their agents, servants, or employés; to all common carriers by land or water; to all veterinary surgeons, and to all others whom it may concern:

His Excellency Governor Hoyt, having decided to coöperate with the executive officers of the States of Massachusetts, Connecticut, New York, and New Jersey, in a united effort to eradicate the disease known as pleuro-pneumonia from the herds of the State, it becomes my duty, under the foregoing commission, to request that you will promptly report to me all cases among neat cattle by you suspected to be contagious or infectious. Without your coöperation and assistance, this attempt can only result in partial success; with it the result can scarcely be doubtful, and the work thus far accomplished gives us assurance of good results.

His Excellency is anxious that all owners of cattle, and others interested, should be fully impressed with the belief that this commission, as well as the laws of 1866 and 1879, for the prevention of the spread of the disease, are in their interest as well as that of the State. It is also the wish of his Excellency, that while the provisions of these laws are fully enforced and made most effective, and their purposes promptly and fully accomplished, it shall, at the same time, be so managed as to cause the least possible inconvenience and injury to all concerned, and with a minimum of expenditure to the State.

I would particularly call your attention to the language used by his Excellency in relation to the line of action to be pursued when interested parties have concealed the existence of the disease in their herds. This provision is very important, not only to the stock owner, but also to the State, for while the concealment of the existence of the disease will result in pecuniary loss to the owner of the stock, it, at the same time, greatly increases the danger of infection, and the subsequent expense to the State. With your active coöperation in this respect, we may hope for the prompt suppression of a disease which, while it has already caused a great loss to our stock owners, will, should it become established in our western States, inflict an incalculable and lasting injury to the stock-raising interests of the whole nation. So far as known, all infected herds in this State have been quarantined, and all diseased animals promptly isolated or killed. In the future, as in the past, it will be our duty to cause as little injury and inconvenience to the owners of stock as is consistent with our duties to the State, and to carry out, to the full letter, the directions of his Excellency relative to the valuation of all stock condemned and killed.

All reports of supposed infection should be made direct to the office, and all interested are requested to accompany the report with a correct and full account of the location of the herd, and the symptoms, in order that all unnecessary expense to the State may be avoided. No special line of action has yet been marked out for application to cattle in motion from one portion of the State to another, or to those in transit to other States, but it will be the duty of those in charge to cause the least possible inconvenience consistent with the best interests of the State.

At the request of the Secretary of the Board of Agriculture, each member of the Senate and House of Representatives had appointed special reporters for his district. These reporters were also furnished with special circulars asking for reports of the prevalence of any disease among the live stock of their district. In this manner the Special Agent of the Governor was furnished with a corps of over four hundred selected agents who immediately reported the existence of any not well understood disease, and in addition to this made regularly quarterly reports upon blanks furnished for the purpose.

Action of the State Authorities.

Under the commission, before quoted, the Special Agent of the Governor has (from March 29, 1879, to January 1, 1883,) placed seventy-seven herds in quarantine. As soon as reported, the herd was visited by the Special Agent, or one of his surgeons, (or both,) and a careful examination made. If, after all possible tests, the surgeon pronounced the disease contagious pleuro-pneumonia, the owner was furnished with a copy of the following notice:

OFFICE OF THE PENNSYLVANIA BOARD OF AGRICULTURE,
Harrisburg, Pa., ... , *188*

It having been officially reported to me that contagious pleuro-pneumonia exists among the cattle of your premises, I do, therefore, by virtue of the authority conferred upon me by the Governor of this State, hereby give notice that all such cattle are placed under strict quarantine, and must not be removed from the premises except under a permit from me. No other cattle must be allowed to come in contact with those in quarantine, nor can any manure, litter, or other vehicles of infection, be allowed to leave the premises except on proper authority. This quarantine will continue until revoked by me. Any breach of this order will incur the penalties of act No. 89; approved April 12th, 1866.

. . . . *Special Agent of the Governor.*
. . . . , *V. S., Inspector.*

When it was deemed advisable, for the purpose of stopping the further spread of the disease, to condemn and kill animals, an attempt was first made by the Governor's agent to arrive at their value, by consultation with the owner, in the presence of witnesses. When this plan failed to reach a result deemed just to the interests of the State, then disinterested parties were called in, and the appraisement made under oath or affirmation. In such cases, and before payment was made, the following form was properly filled up and signed:

OFFICE OF THE PENNSYLVNIA BOARD OF AGRICULTURE,
Harrisburg, Pa., . . , *188* . . .

This is to certify, That in compliance with my instructions from the Governor, and in accordance with the provisions of the act of May 1, 1879, I have this day condemned and ordered killed . . . . , the property of . . . . , of . . . . county, and that said . . . . were valued at . . . . . dollars.

. . . . , *Special Agent of the Governor.*

. . . . , *188* . . .

I hereby certify that I have examined the above-mentioned . . . . , and found . . . . to be infected with pleuro-pneumonia, that . . . been killed in accordance with the above condemnation, and that the above sum was a fair and just valuation.

. . . . , *V, S.*
. . . . , *Owner.*

All bills, no matter what the nature of the payment, are certified as correct by the agent of the Governor; next approved by the Governor, in writing, and afterward approved by the Auditor General and State Treasurer, and are on file in the office of Auditor General.

On assuming the duties involved by the commission from the Governor, his Special Agent was satisfied that two plans were open to him. First, By a large and properly arranged corps of veterinary surgeons the disease might be hunted up, but it was evident that this plan, involving as it did a small payment for animals killed, would be unpopular with the stockowners of the State, and would create a disposition to conceal the existence of the disease, and to rush the infected herds into market, to still further spread the evil. Second, That by paying a fair price for all cattle condemned and killed, we might make it to the interest of the owner to promptly report all cases as soon as they were developed. This latter plan was adopted, and its results prove even more satisfactory than was expected. In all cases the interests of the State have been protected, and the owners of the stock well satisfied with the work. At the same time, the work accomplished has cost but a fraction of the sum which the experience of other States prove would have been necessary. It has been our rule to patiently investigate all cases as soon as possible after they were reported. In many cases this work was done by the Special Agent in person, but in no case were animals condemned without the inspection of a veterinary surgeon, well qualified to act. In many cases (much the larger number) an examination has proven the alarm needless, but it was far better for our ultimate results to investigate many supposed cases, than to allow one real case of infection to escape through the want of proper examination. As will be noticed, the cost of examining cases of this kind forms a very important item in our expenditures, but, at the same time, it also forms an important integer in our success.

Another considerable item of expense was caused by the necessity of placing two of my surgeons in charge of the Philadelphia stock-yards, in order that cows sold might be inspected before going to purchasers in this and other States. This plan, while it proved expensive in its outlay, was in reality an economical precaution, for by it a number of acute and chronic cases were found and prevented from infecting outlying herds, where the expense of eradicating the disease would have reached ten times the amount expended in any case at the yards.

In addition to the care of stock already in the State, the agent of the Governor has, during most of the time since March 29, 1879, had control of all the stock brought into the State from Europe, and not quarantined by the national authorities, or those of other States. The United States Government imposes a quarantine of ninety days upon all such cattle, but in such States as have quarantine regulations already established, they are surrendered to the State authorities for inspection and quarantine. Under the rules formerly in force in this State, these cattle must present a certificate of clearness from any contagious disease at the point of shipment in Europe, where they are inspected by a government surgeon, must be inspected on their arrival in this State by a veterinary surgeon in the employ of this State or United States, must be quarantined closely at the expense of the importer, under the supervision of a surgeon, and must be again examined at the close of the quarantine, and if found clear, are granted a certificate which will authorize the removal to any point in the United States. In enforcing this quarantine, care was taken to consult the interest of the importers, so far as it was consistent with the interests of the State, and the step was made necessary not only to protect our stock from infection by pleuro-pneumonia, but also with hoof and mouth disease, rinderpest, and other contagious diseases.

The following table shows the number of herds quarantined, when quarantined, and when released; number and sex of the animals; source of infection, if known, and name of surgeon in charge:

List of Herds Quarantined from March 29, 1879, to July 1, 1882.

Herd No.	COUNTY.	When quarantined.	When released.	Cows.	Steers and bulls.	Heifers.	Calves.	Source of infection.	Surgeon in charge.
1	York, ...	Mar. 29, 1879	Sept. 4, 1879	4	1	3	2	Baltimore, .	Michiner.
2	Chester, ...	June 12, 1879	Dec. 15, 1879	18	2	2	8	Adj'ing herd,	Rayner.
3	Delaware, . . .	June 13, 1879	June 2, 1880	38	1	10	. .	Philadelphia,	Bridge.
4	Chester, ...	July 7, 1879	Oct. 18, 1879	23	3	. .	1	Unknown, .	Bridge.
5	Chester, ...	July 7, 1879	Oct. 18, 1879	10	1	3	2	No. 4, ...	Bridge.
5½	Chester, . . .	July 7, 1879	Mar. 11, 1880	8	1	2	. .	No. 4 or 5, . .	Bridge.
6	Chester, ...	July 7, 1879	Sept. 18, 1879	22	2	2	. .	Unknown, .	Bridge.
7	Lancaster, . . .	July 9, 1879	July 7, 1880	32	1	5	5	Adj'ing herd,	Rayner.
8	Chester, ...	July 18. 1879	July 26, 1880	15	1	2	1	Herd 2, . . .	Rayner.
9	Chester, ...	Aug. 8, 1879	Nov. 20, 1879	29	1	. .	. .	Doubtful, . .	Rayner.
10	Chester, ...	Aug. 10, 1879	Dec. 19, 1879	. .	1	. .	2	Unknown, .	Rayner.
11	Montgomery, .	Aug. 13, 1879	Jan. 26, 1880	3	. . .	. .	2	Philadelphia,	Michiner.
12	Montgomery, .	Aug. 13, 1879	Jan. 26, 1880	7	. .	. .	. .	Philadelphia,	Michiner.
13	Delaware, . . .	Aug. 4, 1879	Dec. 24, 1879	16	1	. .	4	Unknown, .	Bridge.
14	Delaware, . . .	Aug. 22, 1879	Dec. 24, 1879	18	1	2	3	Unknown, .	Bridge.
15	Montgomery, .	Sept. 24, 1879	Jan. 29, 1880	11	1	. .	2	Philadelphia,	Michiner.
16	Bucks, ...	Sept. 25, 1879	Jan. 29, 1879	4	.	. .	. .	Unknown, .	Michiner.
17	Chester, ...	Sept. 26, 1879	Dec. 19, 1879	9	. . .	1	. .	Unknown, .	Rayner.
18	Delaware, . . .	Oct. 1, 1879	Dec. 24, 1879	15	. .	2	. .	Unknown, .	Bridge.
19	Adams, . . .	Oct. 5, 1879	Mar. 11, 1880	4	5	2	2	Unknown, .	Moriarty.
20	Chester, ...	Oct. 10, 1879	Jan. 10, 1880	13	1	. .	. .	Unknown, .	Rayner.
21	Montgomery, .	Oct. 13, 1879	Mar. 19, 1880	6	. .	. .	. .	Philadelphia,	Michnier.
22	Montgomery, .	Oct. 24, 1879	Mar. 15, 1880	13	1	. .	.	Philadelphia,	Bridge.
23	Bucks, ...	Oct. 29, 1879	Mar. 19, 1880	2	. .	.	1	Philadelphia,	Michiner.
24	Lancaster, . .	Nov. 1, 1879	June 11, 1880	30	3	. .	2	Herd No. 7, .	Rayner.
25	Lancaster, . .	Nov. 1, 1879	Mar. 10, 1880	13	1	4	2	No. 24, . . .	Rayner.
26	Chester, ...	Nov. 1, 1879	Mar. 10, 1880	3	4	1	. .	No. 24, . . .	Rayner.
27	Lehigh, ...	Dec. 13, 1879	May 17, 1880	5	14	10	3	Unknown, .	Michiner.
28	Chester, . . .	Dec. 14, 1879	Mar. 11, 1880	5	21	. .	10	Unknown, .	Rayner.
29	Montgomery, .	Dec. 30, 1879	Aug. 2, 1880	24	1	3	. .	Philadelphia,	Bridge.
30	Montgomery, .	Jan. 1, 1880	June 2, 1880	10	. . .	2	. .	Philadelphia,	Michiner.
31	Montgomery, .	Feb. 6, 1880	June 2, 1880	11	. . .	1	. .	Philadelphia,	Michiner.
32	Montgomery, .	Feb. 11, 1880	June 2, 1880	14	1	4	. .	Philadelphia,	Michiner.
33	Delaware, . . .	Feb. 27, 1880	Aug. 2, 1880	34	1	. .	3	Baltimore, .	Bridge.
34	Chester, ...	Mar. 3, 1880	Aug. 2, 1880	17	3	. .	. .	Maryland, . .	Rayner.
35	Montgomery, .	Mar. 30, 1880	June 21, 1880	13	. . .	. .	. .	Philadelphia,	Michiner.
36	Delaware, . . .	April 5, 1880	Aug. 2, 1880	9	. .	. .	2	Baltimore, .	Bridge.
37	Chester, ...	April 24, 1880	Aug. 2, 1880	16	. . .	3	1	Unknown, .	Bridge.
38	Montgomery, .	May 4, 1880	Aug. 6, 1880	4	1	. .	1	Unknown, .	Michiner.
39	Philadelphia, .	May 6, 1880	Aug. 7, 1880	6	. . .	. .	. .	Philadelphia,	Bridge.
40	Chester, ...	May 12, 1880	Aug. 13, 1880	16	1	. .	1	Unknown, .	Rayner.
41	Philadelphia, .	May 18, 1880	Aug. 18, 1880	9	. . .	1	. .	Philadelphia,	Bridge.
42	Philadelphia, .	May 18, 1880	Aug. 18, 1880	17	1	. .	1	Unknown, .	Bridge.
43	Montgomery, .	May 27, 1880	June 30, 1880	11	1	. .	. .	Unknown, .	Michiner.
44	Montgomery, .	May 31, 1880	Nov. 8, 1880	13	. . .	2	2	Unknown, .	Michiner.
45	Montgomery, .	June 17, 1880	July 5, 1880	5	1	. .	. .	Unknown, .	Michiner.
46	Montgomery, .	June 17, 1880	Nov. 8, 1880	7	. . .	1	. .	Philadelphia,	Michiner.
47	Delaware, . . .	June 26, 1880	Oct. 8, 1880	34	1	2	11	Unknown, .	Bridge.
48	Montgomery, .	July 5, 1880	Nov. 8, 1880	10	. . .	1	. .	Philadelphia,	Michiner.
49	York, ...	July 7, 1880	Nov. 8, 1880	15	1	1	. .	Baltimore, .	Gladfelter
50	Delaware, . . .	July 29, 1880	Nov. 8, 1880	30	1	3	2	Unknown, .	Rayner.
51	Delaware, . . .	Oct. 27, 1880	Dec. 18, 1880	8	1	2	2	Philadelphia,	Bridge.
52	Delaware, . . .	Nov. 8, 1880	Mar. 1, 1880	35	1	. .	2	Philadelphia,	Bridge.
53	Delaware, . . .	Nov. 11, 1880	Dec. 18, 1880	3	. .	. .	. .	Baltimore, .	Bridge.
54	Delaware, . . .	Nov. 8, 1880	Dec. 18, 1880	40	2	1	3	Unknown, .	Bridge.
55	Delaware, . . .	Nov. 8, 1880	Dec. 18, 1880	3	. . .	1	3	Uncertain, .	Bridge.
56	Delaware, . . .	Nov. 8, 1880	Dec. 18, 1880	1	. . .	. .	. .	Baltimore, .	Bridge.
57	Bucks, . . .	Dec. 3, 1880	April 6, 1880	8	. . .	. .	3	Uncertain, .	Michiner.
58	Philadelphia, .	Jan. 22, 1881	April 1, 1880	35	1	3	. .	Philadelphia,	Bridge.
59	Philadelphia, .	Jan. 25, 1881	Feb. 2, 1882	30	1	. .	. .	Uncertain, .	Bridge.
60	Delaware, . . .	Mar. 16, 1881	Aug. 10, 1881	12	1	1	. .	Unknown, .	Bridge.
61	Delaware, . . .	Aug. 23, 1881	Mar. 1, 1882	12	1	2	3	Herd No. 52,	Bridge.
62	Delaware, . . .	Sept. 9, 1881	Mar. 8, 1881	7	2	3	3	Herd 52, . .	Bridge.
63	Montgomery, .	Oct. 9, 1881	Mar. 2, 1882	17	1	1	. .	Uncertain, .	Michiner.
64	Philadelphia, .	Oct. 29, 1881	Mar. 28, 1882	35	1	1	. .	Uncertain, .	Bridge.
65	York, ...	Jan. 3, 1882	May 10, 1882	11	15	3	. .	Baltimore, .	Bridge.
66	York, ...	Jan. 3, 1882	May 10, 1882	1	. . .	. .	. .	Baltimore, .	Bridge.
67	York.	Jan. 3, 1882	May 10, 1882	8	9	. .	3	Baltimore, .	Bridge.
68	Montgomery, .	Jan. 22, 1882	May 2, 1882	14	1	2	3	Uncertain, .	Michiner.
69	Montgomery, .	Jan. 24, 1882	May 2, 1882	12	1	. .	5	Unknown, .	Michiner.
70	Montgomery, .	Jan. 24, 1882	June 3, 1882	12	. . .	. .	. .	Philadelphia,	Michiner.
71	York, ...	Feb. 10, 1882	May 10, 1882	1	1	. .	3	Baltimore, .	Gilmore.
72	Montgomery, .	Mar. 13, 1882	Jan. 3, 1882	6	. .	2	1	Uncertain, .	Michiner.
73	Bucks, . .	Mar. 24, 1882	May 14, 1882	12	. . .	. .	. .	Unknown, .	Michiner.
74	Montgomery, .	Mar. 28, 1882	July 4, 1882	11	1	1	. .	Uncertain, .	Michiner.
75	Montgomery, .	May 31, 1882	July 10, 1882	19	. . .	. .	1	Philadelphia,	Michiner.
76	York, ...	June 22, 1882	. . . .	10	5	5	. .	Maryland, .	Bridge.
77	York, ...	June 22, 1882	Oct. 3, 1882	3	2	2	2	Maryland, .	Bridge.

A careful study of the memoranda of each infected herd permits of the following deductions:

Herd No. 2 may have been infected by the careless use of a drenching-horn, used by its owner among the infected cows of another herd. The two herds were separated by a public road, and care was taken to keep them separated. They drank from one stream, which first passed through the earliest-infected farm. The heavy loss in this herd was mainly due to the fact that the first infected animals were allowed to run with the others until the disease had assumed its contagious form, and we would here record the observation, that in all cases where the State officers were notified as soon as the first infection was noticed, the percentage of loss was very small. In most cases, the disease may be checked by the death of the first diseased animal, if the authorities are only notified before the disease assumes its secondary or contagious form.

The owners of Nos. 2 and 8 agree that the latter herd was infected by the use of the drenching-horn used in herd No. 2, or that the disease was carried by the owner of No. 2 when visiting a sick animal in No. 8.

The source of infection in No. 4 was by no means clear, but it was first shown in a recently purchased animal. There can be no doubt but that herds Nos. 5 and 6 were infected by No. 4, but whether the infection was conveyed by a small stream passing from No. 4 to Nos. 5 and 6, (in the edge of which the pest-infected cow was buried,) we are not prepared to say, but the owners of all of the herds are satisfied that this was the cause of the spread of the infection.

No. 7. Presented one of our worst and most stubborn cases, and this is to be attributed to a delay in reporting the disease, and the absence of proper care in keeping the sick and well separated. An adjoinihg herd, infected by calves from New York, no doubt conveyed the disease to this herd.

No. 24 was no doubt infected by No. 7, as by accident both herds were allowed to mingle for a short time. Nos. 25 and 26 were no doubt infected from the same source, as they both adjoined No. 7.

When the attention of the State officers was called to herd No. 27, six animals were in the worst stages of the disease, and it was deemed safest to kill them all. The thorough infection of the herd was due to the fact that its owner did not understand the nature of the disease. After it was explained to him, the hearty coöperation which he gave the officers no doubt did much to prevent a further spread of the infection in one of our best stock raising districts.

No. 29. Presents a case wherein the loss to the owner and expense to the State was much increased by a want of attention to proper isolation of the sick, and ventilation for the well animals. It also presents the only case of difficulty or dispute between the owners and State officers—a difficulty due mainly to meddlesome neighbors, who misunderstood both the law and the object of the work in hand.

No. 33. Was one of several herds infected by a lot of cows brought from Baltimore and sold at public sale. Every herd into which these cows went was infected, but, owing to the fortunate and early discovery of the trouble and the coöperation of the owners, the total percentage loss was light.

No. 40. Was no doubt infected from No. 20 adjoining, though both owners had taken all precautions to prevent it. After the loss of a number of animals, the owner authorized the State surgeon to indicate all infected animals which were condemned by proper authority, and the perfectly sound animals slaughtered as beef, without any expense to the State. When the expense of the owners of Nos. 2 and 40 are compared, the wisdom of this plan was apparent to all.

No. 52. The only herd the infection of which gave rise to any litigation between adjacent land owners as to their liability to damages from the spread of the infection. As will be noted, this herd was placed in quarantine November 8, 1880, and not released until March 1, 1882. Through what is now plainly shown to be an error of judgment, the law during its passage through the House of Representatives was so modified that while the State authorities could for an indefinite time prevent animals from leaving an infected herd, yet they could not prevent its owners from making purchases of fresh animals at any time. After this herd had been in quarantine and considerable expense (and loss to the owner) had been incurred, the disease was apparently overcome, and no cases of infection were noted for nearly three months. At this stage of the proceeding the owner purchased a number of cows and turned them in with the rest of the herd. The disease soon manifested itself among these newly purchased animals, for which the special agent of the Governor, of course, refused to pay. Where these animals were infected, the disease broke out in two adjoining herds, (Nos. 61 and 62,) and, after no small expense, was finally checked. The owner of No. 61 brought action against the owner of No. 52 for damages. By advice of the Governor's agent, the case was submitted to arbitration. After hearing a number of witnesses, the defendant freely settled the case by paying actual damages, with no allowance for loss of business, &c.

Financial.

The first work undertaken was under the joint resolution of the Senate and House of Representatives, of March 27, 1879. Since that date, the work has been steadily pushed forward, subject only to such delays as are incident to work of this character, for nearly four years. The total expense, up to January 1, 1883, is as follows:

1879.

Expenses under joint resolution of March 27, 1879,	$147 32	
Expenses of commission to determine the existence of the disease,	309 46	
Surgeons' fees, and necessary expenses,	251 83	
Amount paid for animals condemned and killed, under act of May 1, 1879,	1,090 80	
Special Agent's salary and necessary traveling expenses,	521 92	
Postage, telegrams, and other office expenses,	50 70	
		$2,372 03

1880.

Surgeons' fees and expenses,	$1,858 77	
Amount paid for animals,	2,407 35	
Special Agent's salary and expenses,	1,185 60	
Office expenses,	357 91	
		5,809 53

1881.

Surgeons' fees and expenses,	$889 33	
Amount paid for animals,	1,004 10	
Special Agent's salary and expenses,	1,179 10	
Office expenses,	237 19	
		3,309 62

1882.

Surgeons' fees and expenses,	$1,017 39	
Amount paid for animals,	282 30	
Special Agent's salary and expenses,	1,150 11	
Office expenses,	157 63	
		$2,607 43
		$14,098 61

Recapitulation.

Expenses under resolution,	$147 32	
Expenses of commission,	309 46	
Surgeons' fees and expenses,	4,017 32	
Amount paid for animals,	4,784 35	
Special Agent's salary and expenses,	4,036 73	
Office expenses,	803 43	
		$14,098 61

The expenses of the commission involved nothing but actual expenses of commissioners and witnesses; no salary or per diem was paid any one. In 1880, 1881, and 1882, surgeon fees and traveling expenses were very much increased by the fact that it was deemed most economical to place a surgeon in charge of each of the Philadelphia stock-yards, in order that outgoing stock might be inspected. In 1879, and during previous years, a number of dairies were infected by stock purchased in these markets, and under certain circumstances cows were brought from infected districts in Maryland, and sold to innocent purchasers; and there is good reason to suppose that at one time as soon as the disease broke out in a dairy in our own State, the stock was hurried off to market. This increased expense, no doubt, prevented a still greater expense in meeting and combatting the disease, which otherwise would have been carried into dairies and herds by purchasers of infected animals. During 1880, this inspection was for a part of the year given up, hence the decrease of surgeon's fees for that year, and there can be little doubt that the increased amount paid for animals during the same year may be attributed to this mistaken economy.

After 1879, the special agent of the Governor, in many cases, took the place of the surgeons in investigating reported cases, only making use of the surgeons after the existence of the disease was clearly established, and hence the increase in the item of his traveling expenses. Office expenses includes postage, telegrams, express charges, and needed clerical assistance, as authorized by the Governor and approved by the Auditor General.

The surgeons were employed for a fixed per diem, with necessary traveling expenses, not to exceed, except by special order, a fixed rate per day, and they only to be on duty when specially ordered by the Governor's special agent.

Conclusions and Results.

In our dealings with the disease under the immediate direction of the Government for nearly four years, we feel justified in the following deductions, which we here state, more for the purpose of putting them on record, and not with any view of arousing a discussion, which it has always been our rule to avoid, and into which we have never ventured, believing that such was not in the line of our duty. We have found many points upon which our scientists differ, and which it would perhaps be impolitic for us to attempt to decide; but in one point every herd, and each visit made to infected herds, made us the more certain, viz: the infectious and contagious nature of the disease, and its entire difference from all other diseases of the lungs or lung tissue, and, so far as any opinion has been given no one of the owners of infected stock, nor any of those interested who visited the infected herds, doubt the nature and extreme danger of the disease. Whether the disease can only be conveyed from animal to animal by actual contact, or whether it can or cannot be conveyed in the clothing, by the excretion, breath, or animals of another tribe; whether the disease is of ancient or of comparatively recent origin; whether it can be carried from herd to herd by a stream of water; whether it can be intensified in its ravages by bad ventilation or bad treatment; whether a complete separation of a certain specified number of feet of space will or will not prevent infection; whether in its first stages it is or is not contagious; whether it will or will not affect sheep, are all questions for scientists to determine, and which all are lost sight of in the one great question, in the solution of which we are engaged—can the disease be eradicated by prompt and rigid action in the manner proposed?

It will be noted that the commission of the Governor does not permit of a doubt as to the existence or nature of the disease—both (after careful examination by a competent commission) are plainly asserted; hence we have refused to allow ourselves or surgeons to be drawn into any of the finely-drawn scientific discussions alluded to. Nor did his Excellency and the Legislature leave us in doubt as to our line of action or duty on other matters pertaining to the work, but it has been a matter of regret that the act of the Legislature did not allow his Excellency more room for the exercise of judgment and expense in dealing with infected herds. After a careful examination, not only of our own work, but also of the work of Massachusetts, New York, New Jersey, and Maryland, we are satisfied that our law and plan of action might be improved. Our experience with herds No. 3, 4, 5, 6, 7, 8, 12, 15, 20, 24, 25, 26, 29, 30, 31, 40, 52, 57, 61, and 65, proves that if, under the act, the Governor had had authority to, *at the very first infection*, have condemed the infected and slaughtered the well as beef, the expense to the State and loss to the owner would have both been less. In many cases the subsequent visits of the agent of the Governor and surgeon (made absolutely necessary by law) cost more than would have been the original loss on sound animals. In all of these cases it would have been better for the owners had they pursued the plan adopted by the owner of No. 40, whose first loss was much the least. In Massachusetts this plan was found eminently successful, and to its adoption that State owes her exemption to-day. No plans hould be made obligatory upon the officers in charge, for no one plan could be made to fit all cases and all circumstances, but it is plain, after our experience, that the immediate slaughter of an infected herd (the sound animals for beef) will, in the end, cost both owner and State less than the plan which may permit the disease to linger for several months, involving visit after visit, and preventing the owner from replenishing his dairy and resuming his business.

Our views of the result of the work may be thus given. We do not think we have had a single case of the disease during the past year and a half or two years which could not be traced (directly or indirectly) to sources of infection outside of the State, and beyond our control. During the past two years our main sources of infection have been the cattle markets of Baltimore and adjoining counties in Maryland. By the action of the authorities of Maryland, this source of danger has, in great measure, been removed; and while, at the present time, we are not entirely out of danger from this and other possible sources in New York, yet we anticipate no further losses, nor any great expense on the part of the State. If we are right in this, and if by the expenditure of a few thousand dollars by the State she has saved hundreds of thousand dollars to her stock owners, and a much larger amount to the country at large, we think no one will complain. If the work in New York, New Jersey, Maryland, and Pennsylvania, shall demonstrate that this cannot be done, we may still point with pride to the fact that the work has saved more thousand dollars than it has cost in hundreds, and has demonstrated to other States, that when our State is called upon for coöperation in a good cause, she is not slow to respond, and that when so an important an interest is in danger, she is not slow to extend a helping hand.

THE RELATION OF SOILS AND CROPS TO MOISTURE.

By Prof. W. H. JORDAN, *Agricultural Chemist of the Board.*

[*Read at Annual Meeting.*]

This is fast becoming what may properly be called a scientific age.

Agriculture, that oldest and most complex of all industries, has come to have a large interest in even the profoundest sciences. Moreover, there is no one branch of scientific knowledge that can lay a just claim to the right of being considered the farmer's only benefactor.

We hear much said about the benefits that have proceeded from our modern knowledge of chemistry, and it is of incalculable advantage to know about the composition of soils, crops, and animals. But it may be possible, that in our eagerness to appropriate all the aid that this one branch of science can give, we are forgetful of the advantages we are deriving from other sources, and what may be said with reference to the subject about to be discussed, will furnish an illustration of this truth. In considering "the relation of soils and crops to moisture," we enter a field largely outside the province of the chemist. We are now in a domain occupied mainly by the physicist, though of considerable interest to the botanist. Physics has not been looked upon, heretofore, as so directly aiding agriculture, as has been the case with chemistry. But the more we get to know of the conditions with which the farmer has to deal, the more clearly we come to see that, sooner or later, the whole range of scientific knowledge will be taxed to aid in building up the world's great industry.

Until lately but little attention has been given to the study of the practical bearings of the subject under consideration. Year after year, the rain has fallen upon our fields in beneficent showers, sometimes more and sometimes less than we have desired, but to such an extent that the earth has not failed of her increase, so that famine has not come among us; but all this time we have failed largely to realize the importance of, or to even to know about, the stupendous operations involved in the supplying of water to our soils and crops:

We are all of us familiar with the fact that it makes a great difference whether we have a wet or a dry season. The one just past has been an illustration of the effect produced by conditions of extreme dryness. It will be noticed in the State agricultural report for 1881 that the fertilizers applied to the corn at the Central Experimental farm of the college failed to produce any increase of crops. Such was the case also at the Eastern Experimental farm. Not even yard manure, that specific for all the ills of the soil, caused any additional growth. In general, we explain such a result by saying that the season was too dry. How general is such an explanation! Undoubtedly, we shall always continue to have seasons that are too dry, and seasons that are too wet; and, if there is nothing that the tiller of the soil can do to alleviate the conditions that Providence imposes upon him, then he has only to submit to the rulings of a higher power, and to accept the dryness or the wetness with a contented mind.

Fate has not dealt thus harshly with us, however. We have long known that the fertility of our fields can be modified at our will, and the same, undoubtedly, holds true of their state of moisture and their supply of water to growing crops. Let it be understood, however, that we are just entering upon research in this direction. All that can be affirmed now as being definitely known will serve but little more than to indicate what are the possibilities of the future.

The commonly observed phenomena that have to do with soil moisture and the water supply of crops are: (1) That more or less water annually descends upon our fields in the form of rain; and (2) that this water disappears into the soil, or in other directions, as constantly as it comes. As before stated, we sometimes have more water than we need—sometimes, less. We would like to arrange to have just enough all the time, which seems to be impossible. The most we can hope for is that we may learn some ways in which we can aid the soil in getting rid of surplus water, and in retaining a sufficient supply for use during the hot dry period of the year. Let us first get an idea of the quantity of water that is precipitated upon our fields. The amount of rain-fall is measured by an instrument called a rain-gauge, and is estimated in inches. Many observations have been made in different places on the amount of rain-fall. During the years from 1836 to 1843, inclusive, there fell in England, according to observations made by a Mr. Dickinson, 26.6 inches of rain per annum. Dalton, Greaves, and Lawes and Gilbert found 26–28 inches to be the annual rain-fall. Observers in Switzerland arrived at about the same figures. Doctor Sturtevant, of Massachusetts, obtained as the average rain-fall for two years 43½ inches. President Stockbridge, of Amherst Agricultural College, made observations for seven months, during which time 25.7 inches of rain fell. President Fernald, of the Maine State College, has kept a continuous record of the rain-fall in eastern Maine since 1869, which has amounted to an average of 43.87 inches per annum, with a range of from 33.8 to 52.4 inches. At the State College of Pennsylvania the rain-fall for 1881 was 36.81 inches.

Let us estimate the amount of rainfall by the number of barrels, in order to get an expression for the quantity in terms of easier comprehension. A layer of water one inch deep covering an area of one acre, would be equal to 862 barrels, of 31.5 gallons each, or a weight of over 113 tons. On the basis of the figures given above, the amount of water annually poured down upon the earth varies from 22,412 to 37,816 barrels per acre, or nearly 5,000 tons; or, if it could be possible for the rain water to remain where it falls, none running into the soil and none evaporating, navigation in boats would be possible over all our valleys and meadows after one year's rain. These estimates give us some idea of the magnitude of the operations going on all about us in such a way that we ordinarily gain no just conception of them.

Now, what becomes of all this water? It will be disposed of principally in three ways, viz: By drainage either over the surface or through the soil, by evaporation from the soil itself, or by evaporation from vegetation. Failing to pass off in either these ways, the water would remain in the soil. The relative quantities that would disappear by these several channels will depend upon various conditions, the principal of which are the character of the drainage, the kind and texture of the soil, the manner of cultivation, the character and amount of vegetation growing upon the surface, and the nature of the climate and season.

Before discussing how these conditions effect the moisture of the soil, let us notice some of the estimations that have been made as to the amount of water that passes out of the soil by the channels named.

The amount of drainage water is determined by an instrument called a *lysimeter*. A certain area of soil is inclosed in a water-tight box to the depth of three or more feet. The water percolating through is caught in a vessel from which there can be no evaporation, and is then measured.

Mr. Dickinson's observations for eight years showed that 42½ per cent. of the rainfall percolated through the soil, or 57 per cent. evaporated. The variations in evaporation during the eight years were from 43 to 67 per cent. Of course the amount of drainage water was in much greater proportion during the cold months than during the warm. For the six colder months the drainage water was 74½ per cent. of that which fell, while for the warm half of the year the percolation was but 7.1 per cent. of the rainfall, showing an evaporation of 92.9 per cent. Other observers in England and Switzerland have shown that from 20 to 39 per cent. of the water falling upon the surface runs through the soil. Dr. Sturtevant, of Massachusetts, found that for the years 1876 and 1877, the percolation was 10.8 per cent. and 26.4 per cent., respectively. Prof. Stockbridge, of the same State, made observations during seven months, from May to November. and he obtained 20 per cent. of the rainfall in his lysimeter. The latter observer calculated that on those days not raining, an average of a hundred barrels of water was evaporated daily from an acre of such soil as he experimented upon.

If we allow a percolation of twenty-five per cent., or one quarter of the rainfall, we should have in the case of some of the largest rainfalls here noted, an evaporation equal to 80 barrels of water per acre for every day in the year. As nearly all of this evaporation takes place during the warm months, it is not unreasonable to assert that there may be days in the spring or summer when 150 to 200 barrels of water are carried heavenward from an acre of ordinary soil.

Now, this evaporation takes place in two ways, viz: from the soil itself, and from plants growing upon it. Which of these means removes the most water depends upon the extent and character of the vegetation with which the soil is covered.

A few estimates on the amount of evaporation from plants, will not only serve to indicate its extent, but also the importance of a supply of water for plant nutrition.

J. M. Anders showed by some very careful investigations that every square foot of leaf surface evaporates about 1¼ ounces of water daily. All have heard of the Washington Elm standing on Boston common, estimated to have 200,000 square feet of leaf surface. Such a tree would evaporate, at the rate estimated by Mr. Anders, seven and one half tons of water daily.

Hale, a long time ago, calculated that an acre of hops, containing 1.000 hills, would give off into the atmosphere 200 gallons of water each day. One observer (Dresser) has estimated from experiment, that an acre of cabbages planted in rows 18 inches apart, having the plants 18 inches from each other in the row, would evaporate over ten tons of water in twenty-four hours. Pfaff found that an oak tree, close-topped, about twenty feet high, and bearing 700,000 leaves evoporated 123 tons of water during the growing season. An acre, bearing one hundred such trees, which would not be a dense growth, would, at the rate given, make use of 12,300 tons of water in one season. Lawes, of England, found that for every pound of dry substance produced by wheat, barley, and some of the leguminous plants, over 200 pounds of water were taken up by the roots and exhaled by the leaves. According to this estimate, an acre of timothy grass, such as we raised at the college farm the past season, containing 3,560 pounds of dry substance, would require for its growth 356 tons of water. It is not unusual for a crop of corn fodder to involve the growth of four tons of dry matter per acre, and in this case 800 tons of water would be drawn from the soil to meet the demands of a single crop on a single acre. Experiments by Shubler showed that one square foot of pasture grass exhaled in twenty four hours 5½ pounds of water, or at the rate of 109 tons to the acre. As much as 25 tons has been found to evaporate in one day from an an acre of nothing but grass sod. These estimates serve to give us some conception of the immense quantities of water demanded by vegetation, and they leave us no longer in doubt as to the disposal of a large part of the rainfall that occurs during the summer months.

It would be quite natural for some one to interrupt at this point, to say that these facts are all interesting to the curious minded, but that they are facts over which no one has any control. "We can't arrange," says one, "for plants to use any less water than they do, neither can we prevent undue wetness or dryness of our soils." To an extent that is true, yet if we make a brief study of the various conditions that influence the moisture of the soil, we shall see how farmers may exercise some control over the water supply of his crops.

There are three points that we need to discuss in considering the relation of soils to water.

1st. Permeability.

This means the rapidity with which water will find its way down through the soil. It is desirable that standing water do not remain in our fields for any great length of time, especially during the growing season. Prompt drainage is essential, and on some soils is hard to secure.

2. Water-Holding Power.

We have seen what immense quantities of water vegetation must dispose of during a single season. This water must come from the soil, which is a sort of reservoir, from which the roots of plants are constantly pumping, and upon which evaporation in other ways makes large demands. It is important then that the capacity of our soils for furnishing moisture be equal to the demand.

3. Evaporation.

No matter how much water a soil may have in store for use, if evaporation from its surface goes on rapidly, the tendency is to exhaust the supply. During a dry time there should occur the least evaporation that can be secured. Now these three points, as above named, are intimately connected with drainage, the character of soils, method of cultivation, mulching, vegetation, and also to that very important subject, the relation of forests to the water supply of a country.

The matter of *permeability*, in its various bearings, first claims our attention. We may first inquire what the influence of the character of the soil is upon the permeability or rapidity of percolation. Careful experiment has shown that the passage downward of an excess of water is faster in a coarse than in a fine soil, and is more rapid in one that is loose than in one that is compact.

All are aware that drainage is more prompt in a sandy than in a clay soil. It may be desirable to diminish the rapidity of percolation in sandy land, while in fields containing much clay it is often necessary to make the drainage more prompt. And so it makes a great differenee about the compactness of the fine soil. The compacting process is going on constantly in all soils.

A field is plowed in the spring, after which it may seem light and loose down to a considerable depth; but, before the season has passed, the solidifying process has got pretty well under way, and will continue in many soils until the plow is again put to work. The most effective agency in producing this result is the water itself. Rain beats the earth down; finer particles are floated in between coarser, thus filling up the pores. Soils that contain clay become hardened, and glued together, by wetting and drying, and chemical ingredients often act as a cement. Nearly every one is familiar with the fact that a pile of loose sand shrinks in bulk when water is poured upon it. Dry clay, on the contrary, swells when wet, but hardens into a compact mass upon drying. These operations, together with the cementing process induced by various substances, are constantly tending to make rock out of soil, and are what produce compact, impervious, and what are sometimes called "bound-out" fields.

The bearing of these facts upon the office of the farmer is somewhat evident. The need of stirring sandy soils to prevent their becoming too compact, and, therefore, too impermeable, will hardly exist. In fact, such is the dearth of moisture often in sandy fields, and so completely and quickly does rain-water drain through them, that deep and frequent tillage must result in injury rather than good. It is with clay or loamy land that the plow can be most efficient in producing beneficial changes in permeability. The effect of plowing is to break up the compact condition of soil particles, and to cause them to so re-arrange themselves as to increase the ease and rapidity with which an excess of water will pass downward.

Now, it can be said just at this point that, if any one wishes to modify the permeability of a field so as to make it drain more promptly, it makes a great difference at what time land demanding such treatment is plowed; and so we will digress somewhat to make mention of the proper moisture of soils at time of cultivation, if the best results are desired.

The majority of fields are of a loamy or clayey character. If such soils are worked when dry, they break up into lumps, especially those very clayey; and their texture is then very undesirable, both as a home for the roots of plants, and as a water holding and conducting medium.

If cultivation takes places when a clayey land is saturated with moisture, though it may be plastic at the time, it will, after disturbance, harden into a condition not unlike that of a brick. Too little regard is often had for the moisture of heavy soils at the time of working them, and our crops suffer in consequence. There is a medium degree of wetness that we must secure, if we desire not only efficient drainage, but a good place for root development. Sandy soils, or those containing much organic matter, are less affected by the state of moisture at the time of plowing. We can work such more at our convenience.

The force demanded to break off the furrow slice also depends somewhat upon the degree of wetness of the soil. Earth that is very wet or very dry possesses greater tenacity than that which is in a medium state of moisture, and this fact can well be borne in mind if we desire to economize the strength of working animals.

It has been assumed, in speaking of coarse or fine, loose or compact, soils, that they were uniform throughout. There are cases where a coarse layer, or sub-soil, underlies a fine loamy surface soil, and where this occurs the drainage will not be so prompt as if the sub-soil were as fine and compact as that on the surface. Some may be incredulous, and deem this statement inconsistent with those that have preceded it.

Suppose we have clay over sand. Rain falls in excess upon the clay. The water passes down through the fine tubes of the clay and meets the coarser ones of the sand. The flow will then be checked much as if standing water had been reached, Now why? Immerse a fine tube in water, and after drawing it out, observe how a portion of it remains filled with liquid which will not run out. If this tube were to be held in a vertical position and placed in contact at the lower end with the end of a larger one, the water would not run down from the upper tube. But if a tube of the same size or smaller were placed below in exact contact with the one holding the water, the liquid would at once be drawn down. The sandy sub-soil furnishes coarse tubes that meet the finer ones of the surface soil, and the water does not pass readily from one to the other. It has been found by actual experiment that if water be poured upon soil the upper layer of which is packed closer than the lower portion, the liquid will be held back largely by the packed layer.

If we have a loose layer above, the case is reversed, and rain water can easily run down through the loose material, to be taken up by the finer stratum below.

We will pass now to consider the water holding power of soils. Permeability is seen to be of importance as pertaining to the getting rid of an excess of water.

Water-holding power has to do with the sustenance of plants during a hot, dry season. What is meant by water-holding power?

Let us consider for a moment the structure of the soil as related to this question. Imagine for a moment a layer several feet deep of common bird-shot, and instead of the shot being wholly impervious to water, let them be porous so as to absorb moisture. In such a mass of material there would be two kinds of pores, those that are found between the shot or particles, and those that exist in the particles themselves. Such a mass of particles could hold water in two ways. It might contain so much as to completely fill both systems of pores, or only enough to fill the finer pores of the particles, leaving the larger tubes to contain nothing but air. The latter is the proper condition of a well-drained soil, as nearly as can be illustrated. There should be no standing water in the larger pores of the upper strata, and it is the amount of moisture that can be retained by a soil, and not produce such a condition, in which we are interested. It is desirable to have land moist at the same time that the circulation of air is possible. We wish to avoid a saturated condition.

And just here comes in a question pertaining to drainage. As we pass down through any soil we come to a point where all its pores are filled with water, which should be far enough below the surface to allow a proper home for the roots of plants. Let us suppose that we desire a layer of two feet of earth that is not saturated with moisture, but is simply moist. Should we be sure of having this if we were to dig a drain two feet deep? By no means.

If any one will take the trouble to hold a fine glass tube in a vertical position with one end immersed in a dish of water, he will see that the liquid will stand higher in the tube than the level of the surface of the water in the dish, and this difference in level will be greater the finer the tube. If a ditch is dug to a certain depth we can compare the bottom of it to the surface of the water in the dish, which would be the level of what we call bottom water. But just as the water rises in the fine tube above the general level of the water in the dish, so it will rise in the pores or fine tubes of the soil on either side of the ditch to a considerable height above the bottom, and this height will be greater the finer the soil. So the finer and more compact the particles of earth, the deeper the drainage needs to be in order to bring the point of staturation to a proper distance below the surface. So much for drainage.

And now let us consider more directly some of the conditions affecting water-holding power, in the sense previously defined.

Let us suppose that we have columns of various kinds of soil, some coarse and some fine. Let us turn upon each column more than a sufficient amount of water to saturate it completely, after which the excess of water is allowed to run off. We should find that the finer soils retain much the most moisture. Were we to repeat the experiment with columns of the same kind of soil, only having some more compact than others, we should probably find that the most compact columns would retain the most moisture. Fine quartz sand has been found to contain over twice as much water as coarse. Experiments made with quartz sand, loam, and garden mold, showed that the quartz sand absorbed only about one fourth its weight of water, loam one half, while garden mold retains nine tenths its weight. Peat dust absorbed three hundred and seventy-seven per cent. of water, or three and a half times its weight. Humus showed a very large water-holding power.

One of the lessons to be drawn from these results is that sandy or coarse soils are very poor water reservoirs for plants to draw from, but that clayey, loamy soils, or those fine and containing considerable organic matter, are capable of furnishing water to plants for a long time. The addition of organic matter in the shape of muck or yard manure to light sandy land is of great benefit in increasing the available water supply of the plants growing thereon. Clay would also produce the same effect. Experiment also shows that soil compacted will store more water than when in a loose condition after being disturbed. We are now prepared to see how tillage can effect the storage of water in the soil. If we plow land and thus stir it to a considerable depth, we increase the readiness and completeness with which water will flow down through the upper layers of earth, and we therefore diminish water-holding power. There are cases in which such a result is desirable, as with wet, heavy clays. But it might be harmful to stir deeply and often land in which we need to economize the water supply. We can already see, as we shall see more clearly a little later, that it makes a great difference what kind of cultivation we give our fields if we regard the conditions of moisture.

But the subject of evaporation is so closely connected with that of water holding power, that we will at once pass to its consideration. Mention has been made of the immense quantity of water that is evaporated from soils. All have noticed, doubtless, how the surface of the land does not become dry deeper than an inch or so, unless a drought occurs that is quite extended. Moisture is maintained to a perceptible extent nearly to the surface, during an ordinary season. If a hundred barrels of water are evaporated daily from an acre, how is it that the upper layers of earth do not become air-dry? For this simple reason, that the fine pores of the soil are continually raising nearer the surface fresh supplies of moisture. We know how a lamp wick is continually supplying oil to the flame, and finally draws up all that is within its reach. A process somewhat similar is continually going on in the soil, during the warm portions of the year.

Now, there are two conditions that control the amount of exaporation, viz: The extent of surface exposed, and the rapidity with which moisture can be transmitted upward through the soil. We often see the upper surface of a plowed field get very dry. This would not happen if the supply of water below was not small, or if the capacity of the soil for pumping up moisture was not less than the rate of evaporation. The farmer may not be able to control the supply of water that exists in the lower strata of earth, but he can influence the rate of evaporation by retarding the rapidity of transmission upward,

In order to see how this may be, let us glance at the results of experiments on evaporation.

Theory teaches that a fine soil can transmit water to its surface faster than a coarse. Experiment proves such to be the case. Garden mold, loam, or clay, allows a much more rapid evaporation than sand. To be sure, the upper layers of sand may get dryer than the upper layers of clay or loam, but this state of dryness is no indication of the amount of evaporation, or, in other words, it tells nothing about the quantity of water that has been pumped up from below, to be carried off by currents of air. And, as a matter of fact, the fine soil has been found to lose water faster than the coarse.

Of two soils of the same material, one in a compact condition, and the other in a loose, the former has shown itself to be the one that will lose water in the greater quantity, and simply because the latter has not so great a capacity for pumping up moisture to the surface. These facts have been given as referring to uniform soils. Let us see how the matter would stand in cases where the structure consists of layers of different fineness or compactness. As before stated, a loose sub-soil often underlies a quite fine compact surface stratum. How would such a condition affect the rate of evaporation and the water supply?

Of course, water can evaporate only from the surface, and if this be kept moist it must be by a supply of water from below. We have seen that water will stand higher and rise faster in fine than in coarse material. The sub-soil being coarse in the case supposed, moisture would not be transmitted upward rapidly enough to balance the evaporation, and the finer upper layers would become dry, much drier than though the sub-soil was as fine as that on the surface. The extreme dryness, in summer, of fields having a sandy sub-soil, is not due wholly to the fact that less water is retained for use, but partly because moisture cannot be brought up from below with sufficient rapidity to prevent the upper layers becoming parched.

Instead of having the loose layer below a finer, we can have it above, or on the surface, with a fine sub-soil underlying. Here the evaporation would be retarded. in a manner favorable to the sustenance of plants, in a dry time. The immediate upper layers of the soil may become drier for their being in a loose condition, but this very looseness is what is able to prevent, to a large extent, a loss of moisture from the more compact strata beneath. The explanation of this fact is simple. As has been stated, the amount of evaporation depends in part on the rapidity of the transmission of water to the surface of the soil. In the case we are now considering, the water would rise, with a certain rapidity, up to the beginning of the loose upper layer, and then would rise much slower, owing to the greater size of the spaces between the particles of earth. The amount of evaporation is controlled, however, by the rate with which water can get up through the upper layer of soil, and so the evaporation would be less, when this is coarse or loose, than of as fine or compact as the underlying strata. Actual experiment has proven, that if two boxes of the same kind of soil, one being compact throughout, and the other compact excepting a shallow upper layer, the latter evaporates less moisture than the former, though the supply of water be the same in the two cases.

We are now ready to apply some of these facts and principles to farm practice, which is done in the following recapitulation:

1. Land with a loose sub-soil is to be avoided. Even if there be a surface stratum of fine compact material, the soil will neither drain as promptly nor endure a drouth as well as though the sub-soil was a fine and compact as that on the surface.
2. The water supply of a sandy soil is small, and may be diminished by deep and frequent tillage.
3. Heavy soils tend to hold an excess of water, and may need both good drainage and frequent deep stirring to secure a proper condition of moisture.
4. Fine soils store more water for the use of vegetation than coarse.
5. Evaporation is more rapid from fine than from coarse soils.
6. Cultivation, during a drouth, that stirs only a shallow layer of soil on the surface, tends to diminish evaporation, and, therefore, increases the water supply in either loose or compact soils.
7. No cultivation should take place unless the soil is in that state of moisture conducive to proper pulverization.

Several points have not been touched upon. Is it wise to always hill corn, or any crop, if we wish to economize the water supply? It has been found, by actual experiment with various kinds of soil, that when the land is hilled the amount of evaporation is greater than when the land is level, or, at least, the upper layers of soil get drier. With land where a greater degree of dryness is desirable, hilling would seem to be proper; but where it is necessary to increase the water supply of a crop, it would seem better to let the surface remain as level as possible. While it might be wise to hill corn on heavy land, the results would not be so favorable on soil of a light, loose character.

Fields are sometimes rolled with a heavy stone roller, and we often pat the earth down compactly over newly-planted seeds. These operations undoubtedly have the effect to increase the evaporation from the soil, but, at the same time, if the rolled or compacted earth contains seed about to germanate, the amount of moisture immediately about the seed will be greater than though the roller had not been used in the field or the hoe in the garden.

The effect of covering the ground with a layer of loose material, like straw, leaves, or even sand, is one of importance to the gardener and the fruit-grower.

The operation commonly called mulching retards evaporation greatly. Direct experiment has proved that soil littered with some coarse material loses less by evaporation than when left bare.

As we have seen, vaporization of water takes place largely from the immediate upper surface, and when this surface is protected, the drying effect of the sun and wind is greatly diminished.

A layer of straw or leaves has, of course, very little capacity for transmitting water upward to its surface, and retards evaporation much as a shallow layer of loosened soil does, only more completely. Young trees, and all trees standing on land apt to become too dry, may often be saved from the evil effects of a drouth by thorough mulching.

MAPLE SUGAR—ITS COST AND PROFIT.

By C. C. Musselman, *Member from Somerset.*

Read at Spring Meeting.

My appointment to this subject, came at a time when active operations and a forward movement along the whole line of farm work had commenced, consequently the subject did not receive the attention it merits.

The subject of maple sugar has been almost entirely overlooked by State boards, agricultural societies, and farm journals. The importance of this subject is made apparent, when it is shown that the county which I have the honor to represent in this Board is annually producing hundreds of thousands of pounds of this useful and delicious article. I could name farmers in Somerset county who make annually from ten to fifteen thousand pounds of maple sugar, and sell it at from eight to twelve cents per pound, which will nett them about one thousand dollars. And it must be remembered that this is done at a time before active operation on the farm is resumed.

The sugar-maple is one of the most beautiful, most stately, and most graceful trees of the forest, and if to the oak is given the honor of *king* of the forest, we may justly claim for the sugar-maple the title of *queen.*

No other tree supports an equally massive head of foliage by so slender a stem or trunk. But its crowning beauty is the coloring of the leaves in autumn, and the early green garment of nature it puts on in spring. For street planting or promenade grounds it is one of the most desirable trees. Yet, it is no uncommon thing to see whole groves swept away by the ax, and often, too, when the land is of little value for tillage. A grove, or sugar orchard, upon such ground, would not only produce an annual crop of sugar, but it would enhance the value and appearance of the farm, give shelter and protection to the farmer's best friends, the birds, to say nothing of the effect it would have in atttracting rain, and the attachment it would create for children, yes, the whole family, to the old homestead.

A tract of land ever so well farmed, yet made bleak and dreary by stripping it of its trees, lacks some of the best evidence of high civilization. This, looking only to the immediate profit in dollars and cents, is simply a species of barbarism.

There are thousands of acres of rough, hilly, and untillable land, that might be made both profitable and attractive, by sparing and propagating the sugar maple. In order to be productive, a sugar maple must be in a county of a low temperature. Very little sugar is made in southern Pennsylvania at a much lower altitude than two thousand feet above the level of the sea. "The colder the winter the sweeter the sap," is a saying upon which all will agree who have had any experience in sugar-making.

The sugaring season is commonly in March, and comes at a time of the year when farmers have, perhaps, comparatively little else to do. Although it is hard work, requiring constant attention, it is generally made an occasion of much social enjoyment.

Maple sugar and syrup, especially of the first run, is most delicious. The syrup sells readily at one dollar per gallon, and the sugar from eight to twelve cents per pound, and small fancy cakes sell for still more. Two men, with all the modern improvements, will take care and attend to five or six hundred trees. Trees yield from two to ten pounds in a season, and extra trees, with particular care, have yielded as high as twenty pounds. Climate, situation, and fertility of soil, have much to do with the product of the sugar crop.

There are two kinds of maple generally used in sugar-making, commonly called hard and soft maple. While the hard maple yields the sweeter sap, the soft maple produces the more. And while the soft maple commences to run the earlier in the season, the hard maple continues the longer. But, considering all things, the hard maple has the preference. The age of trees is not material; provided that they are of proper size. Trees from ten inches to two or more feet in diameter, are of the most suitable dimensions.

Tapping should be done with care, so as not to injure the tree. It was formerly supposed that a big opening, even a notch cut with an ax, would yield the most sap, but that idea belongs to a semi-barbarous age. It is now known that it is not width but depth that gives the best results. A quarter of an inch opening will run as much sap as a half inch, and not dry out as soon nor do the amount of injury to the tree.

The manufacture of maple sugar, especially in new countries where the trees abound, is a valuable resource; but it is obvious that this mode of obtaining sugar is only destined for certain localities of our national economy, and annually it must give way to the sugar of commerce produced from cane. While other crops, with the population, are increasing, the forest and the amount of maple sugar are decreasing, as the census plainly show.

A maple tree standing upon productive and tillable soil, will not pay for the ground it occupies for making sugar. But standing upon rough, hilly, and untillable soil, it should not only be spared, but cultivated for its usefulness and beauty in the economy of nature.

The subject being before the Board for discussion:

Prof. **MEEHAN**. How long will trees last in good, healthy condition, as compared to those not used for sugar? I ask, because I have always understood from those who make sugar, that the boring of trees does not injure them. I ask, also, whether, from the gentleman's experience, the boring of small holes is not as injurious as making large holes?

Mr. **MUSSELMAN**. If sugar trees are properly used and cared for, the boring with small augers I do not believe will injure them. With a number of trees together, they will last longer than on open ground. I do not believe that a small auger will injure the tree materially.

Dr. **ROLAND**, of York. What age of the tree do you prefer?

Mr. **MUSSELMAN**. That depends upon the soil it is raised on. The tree grows faster on some soils than on others. A sugar tree the size of a stove-pipe you can tap, but a sugar tree ought not to be tapped until it is about ten or twelve inches in diameter.

Mr. **EVES**. How do you conduct the sap from the quarter inch hole into the receptacle?

Mr. **MUSSELMAN**. By spiles. The spiles we generally use are made of elder.

Mr. **TYLER**, of Susquehanna. Did you ever use patent spiles?

Mr. **MUSSELMAN**. There are some cast, but I have never used them, and I do not think them useful. When we bore a tree, we bore in about an inch and a quarter at first, and then, as the season advances, we freshen the hole, by taking an auger of nearly the same size. We ream it, but do not penetrate the tree much. The auger I have is cone-shaped, and the widest part is a little more than a quarter of an inch. After I have bored the hole, I can ream it out as often as I please.

Mr. **EVES**. Is it important that the auger should not penetrate?

Mr. **MUSSELMAN**. The deeper you bore your trees, the more sap you get—that is my experience—but, of course, the more injury you do to the tree.

Prof. **MEEHAN**. In the Western States the Indians made sugar from the fox maple, sometimes called ash-leaved maple. This gave them as much sap, and as good, as the common sugar maple.

Mr. **GARRETSON**. I saw it stated in the *American Agriculturist*, that if you take the branch of a tree, and drive it in the auger hole, that the sap will flow out of the limb just as freely as if there were an open spile put in. I would like to know whether that has been tried or not. It has been stated that by taking the branch of another tree, that would fit the hole, and driving it in, the sap would run out of the pores of that branch equally as well as through an open spile.

Mr. **MUSSELMAN**. That is a new thing to me—that I do not know anything about; but I have very grave doubts about a limb answering the purpose.

Mr. **BARNES**. You say, the deeper you bore into the tree, the more sap you will secure. Does not boring injure the tree, and does not the closing up of that place increase the injury, when you bore to the center of the tree?

Mr. **MUSSELMAN**. I will answer the question in this way: I take it for granted that the sap is the life-blood of the tree. If you go to work and bore the tree through, the more sap you extract from it—the more life you extract from it. That is the idea of it. Certainly the tree must have some blood, to live.

Mr. **BARNES**. And frequent repetitions will injure it?

Mr. **MUSSELMAN**. I think it would have a bad effect upon the tree.

Mr. **TYLER**. The "groves" you speak of are in forests, are they not?

Mr. **MUSSELMAN**. Sometimes in the woods, sometimes in open places.

Mr. **BEARY**, of Lehigh. What are the best means of evaporation?

Mr. **MUSSELMAN**. As in all other business, we have improved very much in sugar boiling. We take shallow pans—the shallower the better—and we evaporate, reducing it down to syrup and sugar.

Mr. **BEARY**. What are the best methods found for clarifying purposes—separating the dross from the sugar?

Mr. **MUSSELMAN**. There are several. For instance, take the white of an egg, or sweet milk. Some try other plans; but they generally take sweet milk or eggs to clarify.

Mr. **BEARY**. I see the custom of our fathers has come down to the present day.

Mr. **MUSSELMAN**. Does that agree with the plans of your fathers?

Mr. **BEARY**. Yes, sir.

Mr. **MUSSELMAN**. This year I had a conversation with a gentleman who made sugar very extensively, and he said he had found nothing better than butter. I have never tried that.

Mr. **BEARY.** Has there been a substitute for bacon, in order to keep the sugar from boiling over?

Mr. **MUSSELMAN.** Yes, sir; fat and lard.

Mr. **BEARY,** That is pretty nearly the same thing.

Mr. **MUSSELMAN.** There is nothing else that I know of.

Mr. **McDOWELL,** of Washington. We have a few sugar trees on our farm, and we opened them one or two years ago; but we did not think it would pay to continue on. We had a can evaporator, but we did not put it in use. The sap was collected in troughs, and some in boxes. We used elder with which to make spiles. We used a three quarter inch auger, and bored in about an inch and a half. For the pan, we took plank fourteen inches in width and two inches thick, and used sheet-iron, nailed around the back. It was tacked on with shoe tacks. Then we built a furnace of sufficient height, and put wood in under that. This would hold about a bushel and a half. We had a chimney adjusted near the pan. There was no smoke at all—it was all drawn out by the draft. We did not find it would pay to keep it up, from the fact that it interfered with our other farm work. Our sheep, particularly took our attention and time. We made both molasses and sugar. I think we kept constantly in place pieces of bacon. When the kettle was full, it would boil up and touch them, and would sink down again; it would not run over the sides, or the lips of the sides of the kettle.

Mr. **MUSSELMAN.** That is pretty much the way we boil sugar. We do not have any trouble, generally, until we come to stir off; then we sometimes have trouble to keep it in the kettle. Sugar makers who understand their business have persons around, so it is kept running in continually. Then there is not that trouble. People who do not go into the business have not the bacon and improvements; and where they have not the improvements—where there is not a stream as thick as my finger continually, when they come to stir off to make the sugar, for instance, they generally have some trouble.

Dr. **ROLAND.** Is there any possibility of boiling the syrup thicker?

Mr. **MUSSELMAN,** Yes, sir; you can boil it as thick as honey. You can boil it so it will become sugar of itself in a few days.

Dr. **ROLAND.** Why is it, that when it is purchased in stores it is as thin as water?

Mr. **MUSSELMAN.** I think you do not get any Somerset county maple syrup as thin as water. We have a great deal of water, but we do not water our syrup; it is simply boiled down. If you want good sugar, get sugar of the "first run"—that is, of the beginning of the season. The best syrup, or sugar, is of the first run—that is, if you want that of peculiarly rich flavor. If you buy the sugar, you can make your molasses or your syrup as you want it. If you make sugar of the first run, it will soon granulate for you; the first run of sap will easily go to sugar. Most of the molasses that is made with us, is generally near the end of the season, when is running what we call "regular sap;" but when you want to get a clear and delicious syrup, you want it from the run at the commencement of the season.

Mr. **PERRIN.** What does the gentleman know about the mixing or adulteration of maple sugar that is practiced?

Mr. **MUSSELMAN.** Out in Somerset we do not know anything at all about such things.

Mr. **SMITH,** of Luzerne. How can the gentleman tell when he has his syrup boiled enough to make molasses, or boiled enough to make sugar? If I understand, it may be hot enough and boiled enough to make merely molasses; but if boiled to a certain degree beyond that, it goes into sugar.

Mr. MUSSELMAN. Yes, sir. That depends upon the thickness of the molasses. We have a way of ascertaining by the way the molasses forms in a tin. When you see it forming in a tin cup, so you can gather it with your knife, then it is in a state for pretty good molasses. If you let it get thicker, by longer boiling, you have very thick molasses. If you want to run it out into sugar, you should take the stirrer and put it in, using it until the syrup is much thicker, when, upon cooling, it will be sugar.

Dr. ROLAND. I am somewhat interested in anything on this subject. I am very fond of both maple sugar and syrup. The member from Somerset (Mr. Musselman) has given me a different idea of the syrup than I have been in the habit of buying. I want to know whether the sugar makers of Somerset county have any partners outside of the county? If they have, I will go directly to headquarters hereafter for syrup.

Mr. MUSSELMAN. I do not know everybody in Somerset county, but I think I know something of the work of our people. I believe we have no middle men there, and no commission houses outside. If the gentleman wants to get the article, he had best write directly to one of the makers of Somerset county. Then he can hardly fail getting it of the right kind.

Mr. BEEBE, of Venango. Scarcity of maple, in comparison with the demand for maple sugar, is rapidly placing the pure article in trade among the things that were. Neither the sugar nor the syrup is pure. There are mixtures whereby it is greatly reduced before it reaches the consumer. I know this from having seen it pure when manufactured, and from an examination of it when retailed.

THE APIARY; ITS CARE AND PROFIT.

By M. W. OLIVER, *Member from Crawford.*

Read at Annual Meeting.

The natural history of the honey bee has been the marvel of all ages, from the time of Adam, the greatest naturalist the world ever produced, who well knew her history when he named the bee "Deborah," in the Hebrew, which means "she that speaks," and the bee's speech is both as sweet and as wise as that of her namesake Deborah, whose wondrous song of victory is written in the Book of Judges. Adam knew that she was able to speak and teach proud man, with all his boasted intellect, many a wise saying, if he was only willing to learn at her school, and so he gave her that name. The first indication of attention to the bee's natural history is contained in the Old Testament, where it is mentioned either in connection with honey and wax, or where describing the very malignant enemies of the children of Israel. Moses says, "The Amorites chased you as do bees." David says, "My enemies compassed me about as do bees." Isaiah, to describe the horrors of an Asyrian invasion of Judea, says, "The Lord shall hiss for the bee that is in the land of Assyria." Honey has ever been considered a delicacy from the beginning of creation till now. In Genesis we read that Jacob, when about sending his sons back to Egypt for corn, bid them take some presents to the royal heads of that country, and among other things mentioned was "a little honey." This shows that honey was ranked among the greatest delicacies of the earth. In Proverbs it is written, "My son, eat thou honey, for it is good." The son finds it *very* good, and apparently eats very liberally, and is made sick, for a short time afterwards a head appears at the window, and a voice says, "Hast thou found honey? Eat so much as is sufficient for the, lest thou be filled therewith. and vomit it." Christ partook of it after his resurrection—"They gave him a piece of an honey-comb." In this manner do many of the sacred writers mention honey, placing it very high among articles which God has kindly given to man through the agency of that respected insect the bee.

Every prosperous colony or family of bees is composed of three classes, viz: a queen, drones, and workers, and when separated from their natural connections they loose all former industry, and soon perish. The queen is the perfect female, and is the mother of the entire colony. Her only work seems to be that of laying eggs, of which she sometimes deposits more than two thousand in a single day. Her shape resembles that of the worker more than the drone, though longer than either, and, like the worker, is possessed of a sting, but will not use it, only when engaged in battle with another queen. Her average age is about three years. The workers are imperfect females, and upon these devolves all the work. They are provided with a sac or bag for gathering honey, and upon their posterior legs are cavities in which to pack the pollen of the flowers for carrying it home to the hive. They are busy all the day gathering honey and pollen, secreting wax, constructing combs, preparing food for feeding the young, keeping out intruders, &c. They are provided with a sting and virulent poison with which to defend themselves and their treasures against marauders. They seldom use their sting when unmolested, except it may be when near their own hive. The age of the worker is from one to eight months; it varies according to the season in which it is hatched. In the busiest season it lives but a few weeks, but when hatched at the beginning of cool weather it lives for several months.

The number of workers in a hive is not uniform, sometimes there are but very few hundred; again, it may contain fifty thousand or more. The drones are the male bees. In size they are much larger than the workers. When on the wing they make a loud buzzing noise, and different from that of the workers. They do no work, gather no honey, defend neither themselves or the treasures in the hive. No sting is given them, consequently one can handle them without any fear. There are but a few hundred of them in any hive. Stronger colonies containing more than weak ones. Their age depends upon the abundance or scarcity of honey. Whenever honey becomes scarce, the workers will destroy all the drones, thus making their life a very precarious one, it being sometimes limited to a few hours, and again extending to a few days, weeks, or months.

But little more than a score of years ago we had in this country but the one kind of bee, viz: the German or common black bee. Since the introduction of the Italian bee, great progress has been made in apiaculture. Of the Italians I need only to say, that all bee-keepers, up with the times, recognize their superiority over our common black bee. The Egyptian bees are exceedingly cross, but are said to be diligent workers and prolific breeders. The Heath bee is found in the heaths of Germany. It does not differ greatly from the common black bee, except in its great disposition to swarm; a single colony having been known to increase in one season, by natural swarming, to twelve. Then we have the Camiolan bees; the Hungarian bee; the bees of Dalmatia; the Smyrnians. But, of these, none but the Italians have proved themselves worthy of an introduction into the apiaries of America. There is a race of bees called the Cyprian bee, towards which much interest is now being manifested, and the friends of which are claiming for it a prosperous future in this country. In Germany, where it has been tried, in almost every instance, it has been called "a high, noble bee race." If this bee proves superior to the Italian, may we not conclude there is yet greater progress to be made in apiaculture than has been? The first requisite for successful bee-keeping is the hive, and *very much* depends upon this. Although the bee may store as much honey in a nail-keg or in a hollow log as in a more expensive hive, yet, in order to have our bees store the honey in the best shape for market, thus enabling the producer to obtain a better price; also, that the apiarist may see to the condition of his bees, and attend to their wants at all times, some kind of a movable frame hive is necessary. It should be neither too large nor too small. One containing about two thousand two hundred cubic inches is near the proper size. It should be no clap-trap or costly affair. The more simple its construction the better. One costing from a dollar to a dollar and a half is good enough. One holding a frame twelve by fourteen and a half inches, and nine to the hive is a very good size, but they should be uniform, for system in apiaculture is of vast importance.

The dairyman has long since learned that his profits during the coming season, from his dairy, depend very much upon the condition in which his cows have been wintered. So with the apiarist. If his colonies are found to be strong in the spring, his income is sure to be greater than if they are weak and dwindling. In a strong colony, the queen will begin to lay soon after the holidays, and by May 15 natural swarming commences. The old queen, having deposited her eggs in the empty cells until the hive is full of young bees and brood in different stages of maturity, and new queen cells formed and the young queen about ready to come from her cell, takes a portion of the bees, and issues from the hive to seek a new home. The parent swarm, if the honey season is a good one, will be ready to send out another swarm in from eight to ten days after the first one left. But unless the parent colony is a very strong one, and the second swarm a large one, it should be returned to the hive from which it issued, if honey is what you are seeking for. But when the second swarm is returned, care should be taken to remove all queen cells within the hive, so that but one queen is left within the hive, or the bees will soon swarm out again, for too much swarming is destructive to success. There are those who prefer division, or artificial swarming, to natural swarming. This is accomplished in this way: About the time white clover comes into bloom, take from three or four of the strongest colonies a frame of brood comb, with all adhering bees, putting them in a new hive, and by using the division board, the space within the hive is contracted to the requirements of the new colony. As soon as the next day, a queen cell, nearly ready to hatch, should be given them. A colony should be set to rearing queen cells some ten days before these artificial swarms are made. As soon as the young queen commences to lay, the division board should be moved back and an empty frame inserted. This may be done every few days, until the hive is full. When the clover begins to bloom, all surplus arrangements, whether for comb or extracted honey, should be placed on the hive, so that the bees may not want for room in which to store their collected treasures.

Now, there are three requisites towards securing a large yield of honey in a good season, a fair yield in a medium season, and a little in a very poor season. First and most important is the man or apiarist. The man that knows just when and how to do a thing, so that everything is done just at the right time and in the right place; and, also, knowing how to use and having all the modern appliances for successful honey-raising, will rarely have cause to complain of his poor success. Second, a race of industrious bees, whose queens shall keep the combs in the brood-chamber well occupied with brood at all times till the honey harvest closes for the season. To this end each one should breed only from queens that give the best results as producing honey gatherers in their progeny. Third, good bee pasturage, for let it be understood that the bee does not make honey, she only gathers what she finds upon the flowers. Honey is sold in the market in two forms, viz: comb-honey and extracted honey. Comb-honey brings the highest price, and it should, as it costs more to produce it. There is, however, in many places a prejudice to liquid or extracted honey from fear of its adulteration. But with more than half of the people the evidence to them that it is impure honey is the *sure* evidence to the apiarist that the honey is pure. Liquid honey that will candy *is pure*. Is there any profit in the bee business? In answer, I would say it is not unlike many other rural pursuits. Who among you would buy a fine flock of Cotswold sheep, a herd of Holstein cows, or a good stock of Berkshire pigs, and turn them upon the commons with no care and expect a large profit. In the same way if he buys a full colony of Italian bees, and puts them in a rough box hive to take care of themselves, he may have all the profits alone, I do not wish to share them with him.

We, however, have statistics from almost every State in the union where it pays from one hundred to three hundred per cent. on the capital invested. Not only so, it is a business in which ladies can engage as well as men, and I believe some of the most successful apiarists in the United States are ladies, and I would that more of the ladies in this country, who are left with small means and can hardly keep the wolf from the door, could be induced to engage in the keeping of a few colonies of bees. Successful bee keeping does not depend on a large apiary run on the highest style of art. Prudent and skillful management, coupled with energy and industry, almost always brings success in all departments of life; but in nothing is it more absolutely necessary than in the successful management of bees. So much depends upon the man, upon his industry, his energy, his habits of thinking and investigation, his perseverance and unbending determination to succeed, that I am forced to say that success in bee keeping depends upon the man. Of course, the elements or conditions of success must be present. The flora must be in the fields, and the honey in the tiny cells of the flowers; but to gather it in and secure and save the greatest possible amount is where the prudent and skillful management comes in. Leave not a stone unturned, seek to know the wants and condition of every hive, read and think, compare and examine all the bearings upon the subject, and success will be yours, unless the honey be absent from the fields. And this same tenacity to business brings success in all departments of life, I care not whether it be with the professions or with the humble but none the less noble calling of farming.

In conclusion, let me say I would not for one moment encourage anyone to engage in this enterprise without first having a taste for this rural branch. Could you see in this field of labor a beauty, a grandeur that would give you a pleasure to follow, then I would say to you, as a friend, that you can make it one of the most successful occupations of the day, and would warrant you a successful future.

ICE-HOUSES FOR FARMERS.

By H. M. ENGLE, *Member from Lancaster.*

Read at Autumn meeting.

Some of us very well remember the time when ice in summer was considered a luxury, when only hotel keepers and a few wealthy persons in towns and cities would secure it for cooling water for drinking purposes. It is, however, no longer considered merely a luxury, but an actual necessity, not only for drinking purposes, but for the preservation of meats, fruits, vegetables, etc. During several decades past many ice-houses have been constructed by farmers; first, for the purpose of having fresh drinking water in their fields, thus saving a great deal carrying of water during the heat of summer; latterly, however, much is used in refrigerators to keep fresh and sweet milk, butter, and many other articles of diet, which cannot be kept thus in a common cellar.

Much improvement has been made in the construction of ice-houses, and there is still room for further improvement, especially on a small scale. The latter is an important matter, as many farmers have to haul their ice quite a distance, consequently they will try to get along with as small a quantity as possible. One fact, however, we must not lose sight of, *i. e.*, that the smaller the body of ice the greater will be the proportion of waste. It is, therefore, very important to such as store small bodies to properly construct their houses, how to store it, as well as to prevent waste when stored, as many let much more waste than they use.

The first object in building an ice-house should be the possible capacity for future wants. Second, to construct it in the best possible manner to preserve ice when stored.

In agricultural and other papers various plans have been recommended. Some advise to build above ground; others would have the bulk of ice in cellar. Some recommend double walls filled with tan or sawdust, while others would leave the air chambers open. Some advise not to build in connection with other buildings, while others recommend to place the ice-house within another building. The latter is an excellent plan to preserve ice, as it breaks the force of the wind, which wastes more ice than the rays of the sun, and for this reason, in whatever manner the house may be constructed, the outside walls should be made as tight as possible.

Many make the mistake that I did in building my first house, *i. e.*, to put in a tight ceiling or line the roof over the ice; in short, they make it as tight as possible overhead to prevent the heat from coming down upon the ice, forgetting a principle in pneumatics that heated air ascends while cold decends. By these means I smothered my ice for several seasons before I found out my mistake. The last one that I put up is within a wood-house, about seven feet in the ground, and about eight feet above, reaching to the base of rafters of wood-house. When filled, the ice is well-covered with sawdust, and nothing else overhead except the roof of wood-house. This has not been altogether empty of ice in the last five or six years, and not in twenty years, except when we failed to get a supply for filling. This house is only nine feet square, with a cut-off below, as follows:

Scantling or heavy plank, about ten feet long, are set across the cellar, with one end on the floor and the other resting against the side, leaving the width between the wall and plank four feet or more. At one corner is a trapdoor and steps to get down under the plank set sloping. At the opposite end of this apartment is a pit about eight inches deeper than the floor, to receive the waste water, into which milk is set to cool, the entire floor of ice-house inclining toward said pit. In this apartment are kept not only milk and cream, but other articles to be kept fresh; here milk is kept sweet four to five days during June and July, and two to three days during August and September, and cream up to said time must be warmed for churning. The pit referred to is made of brick, and cemented to hold the water accumulating from waste ice, which, if well secured, will not be more than a few buckets a week to be carried out. A pump would, perhaps, be required for a large structure of this kind, where no outlet could be made. The milk of five or six cows, besides other articles of diet, can easily be kept in this little side room, by a little crowding. I have kept, in addition, six to ten bushels of perishable fruits to retard their ripening.

For the purpose of carrying off heat and impure air, there is an air-chamber from where the plank rests against the side, to the top of ice-house, five to six inches wide. I have been thus definite in describing my own experience to show what can be done on a small scale at small cost. In this section, ice-houses have been built with side cellar partition, vertical; but these have been found to be of little account when the weather got warm, the ice wasting away from partition, while, with my plan, the ice will rest on the plank, and consequently cool the apartment below, until the ice gets too low. A few houses have been built with apartment under the ice, which is on the fruit-preserving-house plan; but this is most expensive, wastes more ice, and there will be continual dripping unless water-tight. Having built the house to our satisfaction, the filling is an important matter. Many have an idea that when the house is full of ice they are all right, but rest assured the closer ice is packed, the better it will keep. To pack close, ice should be cut in squares. This is the custom where ice is stored on a large scale, where ice plows are used. In this section, farmers and others use cross-cut saws; one handle being taken out. A good hand will cut a large quantity in a day. It is generally cut in squares from sixteen to twenty inches, or more, according to thickness.

Some saw both ways, while others saw one way and cut the other with an ax or broad-ax. When ice is cut square and is of regular thickness it can be packed tight enough without much filling of crevices; but by no device can it be packed as tight as with snow. By scattering snow on the ice, and with a broom sweep it back and forth until the crevices are full, and then spread an inch or two upon each layer, it can be made as tight as a mortar wall, all of which will add very much toward preserving it.

When the house is filled the ice should have a good covering of sawdust, shavings, tan, or chaff (but always preferring sawdust) before it wastes much, and, as warm weather comes in, it should be closely watched as it wastes around the sides, which should be continually filled up and plenty of material always on hand to keep it well covered. A strong, warm wind will sometimes in twenty-four hours waste more than would otherwise waste in a month when well protected.

I find no difference in the keeping of ice, whether double boarded with an air chamber or said air chamber filled with some material. The most important is to have the outside as tight as possible. No matter how the walls are constructed the ice will waste around the outside, so that the filling of the openings must always be resorted to for its preservation. By my arrangement above described the ice will waste faster than without said cut-off for side cellar, but not near so much as would be required to keep cool the same articles in a refrigerator, besides the time and labor required to keep the refrigerator supplied with ice.

With my arrangement we have no occasion to take out ice except for drinking purposes. I would, of course, not venture a house on my plan smaller than that described. One a little larger would not waste the ice quite so fast, and would keep the side apartment at a lower temperature later in the season.

TREATMENT AND MANAGEMENT OF DAIRY COWS.

By C. C. Musselman, *Member from Somerset.*

Read at Annual Meeting.

The topic assigned to me is, perhaps, the most important subject that could engage the attention of the State Board of Agriculture of Pennsylvania. We generally preach more than we practice; but on this subject I will try and be consistent.

In this fast age, of fast horses and fast living generally, the slow and submissive cow, with all her usefulness, is too often left to browse around and shift for herself.

The noble horse is often kept as a matter of fancy; the humble cow is always kept as a matter of dollars and cents. One thing is certain, be it horse or cow, and that is, that farmers *cannot afford to keep poor stock, especially cows.* They require nearly as much care and attention as stock of the best quality, and it is equally certain that stock of ever so good a quality will be sure to deteriorate and sink to the level of poor stock by neglect and want of proper attention.

No branch of dairy farming can compare in importance with the management of cows. Therefore, the highest success will depend very much upon the "*treatment and management of dairy cows.*" Whatever breed be selected, or whatever amount of attention be given to the points of the animal, experience shows that "very little milk comes out of the bag that is not first put into the throat."

It is poor economy to keep too many cows, for the amount of feed we have. One good cow, well bred and well fed, will yield as much as two ordinary cows, kept in an ordinary way, while a saving is effected both in labor and room required, and in the risk of the capital invested.

Much is said of the amount of food a cow should have. No standard amount can be fixed, unless cows are kept of exactly the same in every particular, a thing that cannot be done. Let reason and common sense dictate, then *let her eat and drink all she can.* Always remembering that a cow is only a living machine, by which milk is manufactured out of the food and water she consumes.

With respect to the exact routine to be pursued, no rule could be prescribed which would apply to all cases; each individual must be governed by circumstances both in respect to the kind of feed, season of the year and system of feeding. We keep from twelve to fifteen cows, under my immediate care on the " Home Farm." The cows are generally of our own raising, selected with care, and from the best milkers. About once in a year, at the greatest flow of milk, the product of each cow is kept and churned separately and the difference particularly noted, in regard to quantity, quality, and color.

By reference to my diary, I find that some of the most profuse milkers gave poor milk. Such cows are only worth keeping where the milk can be sold to a clever fellow at a cheese factory. Quality as much as quantity of milk, has much to do, with the value of a cow. We have kept cows more for the color of her cream than for anything else.

We always keep a sprinkle of Alderneys, to give richness and color to butter. Feed has much to do with color, and quality of milk, cream and butter. If any one doubts this assertion, let him feed his cows garlic and be convinced. But some cows give richer milk in quality and color, if fed on straw in midwinter, than others in midsummer if fed on clover, the feed of all others, for richness and color.

Without going into detail, as to how and with what to feed dairy stock, whatever is done, should be well done, and with great regularity. I consider a feed cutter almost indispensable on a dairy farm, and the cow is the best feed cutter for everything that she can easily manage. The machine is only an assistant to the animal. I would not recommend a little hand cutter, that takes more wear and tear from a man, than the cut fodder will put on the animal, but a power machine, with which you can cut all coarse and inferior fodder and mix it with something better. I have in my barn, all winter, attached to horse-power, a No. 4, Dexter, the largest power cutter, which I consider the best machine. I have none for sale.

My cows are tied and milked during the summer in a shed, made for that very purpose, not a rickety rough old thing, in which a decent hightoned cow would refuse to go, but a nicely painted building, fifty feet long. A building that might be taken for our dwelling if it were one story higher. It has a pig-pen at one end, and a water-tight cellar, to catch the liquid manure, which is pumped into a vessel and haul over the meadow. Such a milk shed I consider a very important auxiliary to a dairy farm. Cows will soon learn to go into their stalls, where they remain quiet, and out of the burning sun, rain and mud. They have generally something in the trough to eat while they are being milked. Such treatment will not only improve the quality and quantity of milk, but cows will more readily and freely give it down.

As long as the grass is young and tender, cows should have some dry feed. We feed, at the time of milking, chop composed of corn and oats, of equal quantity, mixed and ground together. As the pasture becomes more solid, wheat bran is substituted, until finally nothing but bran and salt is given. Excepting good pasture, I know of nothing cheaper and better to increase the flow of milk than wheat bran, and it need not to be entirely pure bran, either, if a little shorts is mixed, it will be all the better.

It is held that the process of digestion goes on best, when the stomach is sufficiently filled, for the reason a highly concentrated food alone is not advisable, the nutritive qualities of concentrated food, such as grain, oil cake, &c., should be mixed with sufficient bulk.

The less cows are exposed to the cold in winter the better. They eat less, thrive better, and give more milk. Therefore, the closer they are kept in clean warm stables the better. A curry-comb is to a cow what it is to a horse, only more so; while it promotes the health and condition of both, it becomes an absolute necessary, to cleanliness in a dairy.

Good pure water is an important item on a dairy farm. The person who thinks that cattle do not know the difference between good and bad water, knows very little about it. We have a nice clear brook, running on one side of the barn, and a watering trough on the other side, which is supplied from a good spring at the house, but while they are equally near, there is always a scramble for the trough, and only those that are driven off, reluctantly go to the brook, which, in its source, is the same kind of water as the spring at the house. The occupants of but one stable are let out at a time; while they drink the stable is cleaned and put in order; then the next stable is attended to, until all have had their turn; as soon as the cattle return from the water, they are put back in their stables.

It is simply cruel to let cows out in the morning to fill themselves with ice-cold water, and then let them stand out shivering through a cold winter day, as many farmers do. Some humane society would have good cases to prosecute for cruelty to animals, to say nothing of economy on the part of the perpetrators.

Succulent food, in which water abounds, such as turnips, young grass, &c., increases the quantity more than the quality of milk, and the milkman can make thin milk without diluting it with water. Though the yield of milk may be increased, by succulent or watery food, it should be given so as not to interfere with the health of the cow. As above stated, the dairy cow is only a machine by which milk is manufactured, and like all other machinery, she should be *well greased herself.*

The dairy cow should be regarded as an instrument of transformation. The question should be, with so much hay, so much grain, roots, &c., how can the most milk, butter, or cheese be made? But the question with many farmers seems to be, with how little food can a cow be kept alive?

The conduct of a manufacturer who owned good machinery and raw material, would be considered very absurd, if he refused to supply the necessary materials to the machinery at work, and to run it to its full capacity, would only be the part of wisdom and good management. Therefore, *stimulate the appetite*, *induce her to eat*, by a frequent change of food, not merely enough to supply the constant demand of the system, but enough and to spare, of a food adapted to the production of a good quality of milk.

Great care should be taken not to frighten or excite the cows. The great secret of success might be summed up in the following few words: *Treat cows kindly practice cleanliness, and* FEED LIBERALLY. Let that be the motto of every dairyman. Post it up over the barn door, and repeat it to the boys.

SUBSTITUTES FOR HAY.

The correspondence of the Board clearly proves that, taking our State as a whole, our farmers feed more grain in proportion to their hay than they did thirty years ago. In the neighborhood of our large cities and towns the bulky nature of the crop and the high rates of freight prevent the transportation of hay for any great distance. The demand has increased faster than the supply, and has, in a measure, forced the substitution of grain and other less expensive or less bulky food. The great increase of dairy products near our large cities has caused a much greater consumption (in proportion to the area) of milk-producing material, and grain and bran have to a certain extent supplied the deficiency.

In view of these and other facts, which might be given, the feeding value of hay when compared with that of corn, bran, and other possible substitutes, becomes an important matter. So far as scientific analyses can do so, chemists have established the *theoretical* feeding value of each kind of stock food, but practice demonstrates that these values cannot always be depended upon, and that the results in the laboratory will not always correspond with those of the stable and feed trough.

In order, if possible, to furnish information as to the relative practical value of tested substitutes, the Secretary has, by correspondence, collected a number of reports which are here offered in a condensed form with the caution that the condensation has, in some cases, destroyed the proper continuity of the thoughts of the original writer.

Corn Fodder and Meal.

A Bucks county correspondent furnishes the following as the result of an experiment to test the value of corn fodder and meal as a substitution for good marketable hay—a substitution of much importance to farmers whose hay so nearly approaches corn meal in value, weight for weight, and very often exceeds that of good wheat bran, and we give it as it was sent to us.

' William C. Blackfan bought in the fall of 1881 twelve steers, weighing eight hundred and sixty pounds per head, for over-keepers to convert the straw and fodder into manure during the winter and turn on grass in the spring. The high price of hay induced him to find a substitute. He cut his stalks with a cutter run by horse-power, as is usually done for feeding mixed mess, and put into a mixing trough half a bushel or more for each steer. He wet them twelve hours before feeding, and at feeding time, morning and evening, put on three quarts for each steer of the following mixture: One ton of wheat bran, three hundred and fifty pounds of corn meal, and one hundred and fifty pounds of oil cake meal. The meal was then thoroughly mixed with the stalks, which had become softened, and all fed to the cattle. The result is his steers are in better condition than usual at the same season. Indeed, most of them will be good beef before time to turn to grass. They have had *no hay.* The bran and meal which he has substituted for hay has cost him less than one hundred dollars—a clear saving of the extra hundred, less the stalks cut. A number of the members of the club visited his barn after the meeting, and were highly gratified at the success of his experiment. His milk cows were fed with four quarts of the same mixture twice a day on stalks with a little hay, and had never done better.

Mr. Blackfan's arrangements for feeding in this way are complete. Shutes lead from the floor on which the stalks are cut and from the granary where the meal is kept to the mixing trough, thus saving all unnecessary handling, while a hose from the hydrant brings the water from the same point. Mr. Blackfan states that he made inquiry about using cake meal as a feed for the desired purpose, but could get no definite answer, so he examined closely the analyses of bran, corn meal, and cake meal, as well as corn fodder, then comparing the same with the hay feed solved the problem and rated the mixture of feed and feeding. Satisfied the experiment would succeed, he hauled out ten tons of hay and realized from it twenty-two dollars per ton. Then he filled the vacancy with fodder from the field, so that it would be dry and ready to cut at any time. He is well satisfied the farm will not suffer from the experiment."

Some of our correspondents who have tried coarse fodder and meal as a substitute for hay object to the use of all of the stalk. They claim that in most cases the animals will reject the butts and coarser parts, amounting in some cases to ten per cent. of the weight of the whole, and that more or less meal, by adhering to this rejected portion, is lost to the feeder, and that this per cent. of loss is increased if the provender is moistened. To prevent this, many prefer to use only that portion of the stalk above the band or husk, and remove the lower portions by first cutting the sheaf in two parts with a broad-ax. Several of our correspondents claim a gain by enclosing their mixed fodder and meal in a tight box and wetting it with hot water several hours before feeding, using care to retain the heat as long as possible. One or two prefer to mix their feed twenty-four hours before it is needed.

Professor J. W. Sanborn, of the New Hampshire Agricultural College, in order to test the value of corn-meal as a partial substitute for good hay, instituted a series of experiments, and prefaces his report of the result with the following remarks:

"The comparative value of these two feeds (corn-meal and hay) is a matter of great practical importance. Various and wide estimates are made by feeders of their relative feeding value. Chemists have assigned theoretical values to each of these feeds. These values have been the only basis of comparison available. In order to obtain a practical standard from comparison of the feeding value of corn and hay, feeding experiments have been continued two winters."

The result of the experiment as we have it condensed is as follows:

Lot 1—fed hay and corn-meal, weight 1,928 pounds. Lot 2—fed hay alone, weight 2,270 pounds. Lot 1 consumed, per 1,000 pounds live weight, daily 22.7 pounds hay and 12 pounds corn-meal. Lot 2 consumed, per 1,000 pounds live weight, daily 24.5 pounds of hay. Gain lot 1 for 42 days, 102 pounds. Grain lot 2 for 42 days 30 pounds. With meal at $20 per ton and hay at $10, the cost of keeping lot 1 was, for 42 days, $5 04 for meal, $9 48 for hay; total, $14 52. Lot 2, the cost of keeping 42 days was $11 70. Value of gain of lot 1, at 4 cents per pound, $4 08. Value of gain of lot 2, at 4 cents per pound, $1 20. Lot 1, cost of keep above value of growth, $10 46. Lot 2, cost of keep above value of growth, $10 50.

To this result we add the following as written by Professor Sanborn:

"The above figures do not represent fairly the value of meal as a supplementary food to hay, for equivalent weights of steer. Assuming steers to weigh two thousand pounds, and taking the per cent. eaten, as above, then lot one would consume, in 42 days, 1,906 pounds hay and 504 pounds meal; lot two would consume, in 42 days, 2,058 pounds hay.

"Thus 504 pounds meal would save 152 pounds of hay, and make 70 pounds more of growth. Total value of hay saved and growth made, $3 56. This value would represent the return for 504 pounds meal, or 70.6 cents per 100 pounds meal, or 39.5 cents for 56 pounds. The direct value (or value of fodder saved and growth made) would make 100 pounds of hay, financially as valuable as 70.8 pounds of corn meal; that is, the growth made (at 4 cents per pound) from 70.8 pounds of corn meal would give no better return than from 100 pounds of hay. This statement of the result is not theoretically correct, and is only an approximation of practical values. The increased growth from corn meal gives increased value to the beast, and hastens his maturity. The common practice among farmers in New Hampshire is to fatten steers in the pasture. And as winter growth on thousand-pound steers does not pay, winter food is looked upon as a means to carry steers through to the cheap growth of summer. Viewed from this standpoint, it is seen by the figures of the experiment that corn meal at $20 per ton cannot economically replace hay at $10 per ton. It may be considered that better growth in winter, arising from feeding corn meal, will have further compensation in better growth and selling value in summer.

"A similar experiment tried on the same farm, but during another season, gives the following result:

"Lot 1 weighed 2,068 pounds—feed corn meal and hay; lot 2 weighed 2,065 pounds—feed hay. Lot 1 consumed in 56 days 2,172 pounds hay and 446 pounds corn meal; lot 2 consumed in 56 days 2,542 pounds hay. Lot 1 gained 69 pounds; lot 2 lost 12 pounds.

"The food of each lot was then changed, lot 1 having hay and corn meal and lot 1 hay alone. After this change, lot 1 gained on hay alone, for 56 days after the change, 113 pounds; lot 2 gained on hay and meal, for 56 days, 117 pounds. Lot 1 consumed in 56 days 2,725 pounds of hay; lot 2 consumed in 56 days 2,145 pounds of hay and 500 pounds of corn meal. First period, 446 pounds of meal replaced 330 pounds of hay, or one pound of meal .74 pounds of hay. Second period, 500 pounds of meal replaced 580 pounds of hay, or one pound of meal 1.16 pounds of hay."

From this experiment Professor Sanborn makes the following deductions: "A comparison of figures will show that lot 1, in the first period, used the meal more largely for growth, and less as a substitute for hay, than did lot 2, of the second period. We have not space nor facts enough to warrant a discussion of the matter. It is clear, however, that an animal that uses concentrated food largely to supplant hay, uses it at a disadvantage. The steer that is fed to the best advantage, is one that directs the excess food thus given to growth; thus lot 1, of first period, at prices previously named, gave in growth and hay saved, over the lot fed on hay alone, for every pound of meal given, 1.1 cent, or little more than full value of the meal; while lot 2, on hay and meal only, returned over the lot on hay .6 cents per pound of meal given.

"Total growth of steers on hay alone, for 112 days, 101 pounds; total growth of steers on hay and meal, for 112 days, 186 pounds. Consumed, when hay alone was given, 5,227 pounds; consumed when hay and meal were given, 4,317 pounds hay, and 946 pounds meal.

"Thus 946 pounds meal have presumably replaced 910 pounds hay, and given a growth of 85 pounds. Estimating hay saved and growth made at prices as before, and 946 pounds meal have given a return of $7.95, or 84 cents per 100 pounds of meal. At points where hay is $13 per ton and upwards, these figures would indicate that the use of meal at a cent a pound would be profitable practice in place of hay alone. Many experiments are wanted before a just conclusion can be drawn, the individual characteristics of steers varying the results to such a degree; for it will be seen that during the first period of the experiment, the meal fed to lot 1 returned a profit for its use, while fed to lot 2, during the second period, but about one half of the value given was returned. I do not think this result should be considered accidental, but rather as one that concerns the animal physiologist."

On the same farm a somewhat similar test was made for the purpose of determining the value of roots as to stock food with the following condensed results:

Lot 1, two steers, weight 2,350 pounds; fed mangels, &c. Lot 2, two steers, weight 2,598 pounds; food contained no mangels. Lot 1, weight February 16, or at the expiration of forty-nine days, 2,463 pounds. Lot 2, weight February 16, or at the expiration of forty-nine days, 2,694 pounds.

Lot 1 ate 60 pounds of mangels daily, and 147 pounds cob meal 1,334 pounds of stover, (corn fodder,) and 1,472 pounds of good hay for the period. Lot 2 ate 147 pounds of cob meal, 1,610 pounds of stover, and 1,715 pounds of hay for the period. Lot 1 gained 113 pounds. Lot 2 gained 98 pounds. The food of each lot was then changed, No. 2 getting mangels and No. 1 meal. The result was that lot 1 weighed April 5, or at the end of second forty-nine days, 2,588 pounds; gain 125 pounds. Lot 2 weighed April 5, or at end of second forty-nine days, 2,892 pounds; gain 198 pounds. Lot 1 consumed 147 pounds cob meal, 1,552 pounds stover, and 1,577 pounds clover and English hay. Lot 2 ate 60 pounds mangels daily, and 1,592 pounds stover, 147 pounds cob meal, and 1,705 pounds clover and English hay.

From this experiment Prof. Sanborn draws the following deductions:

"Excess of grain of mangel-fed steers for ninety-eight days, 78 pounds; at four and a half cents, three dollars and fifty-one cents. Excess of food consumed by non-mangel-fed steers amounts to 236 pounds stover (fodder) and 115 pounds of hay for ninety-eight days. The value of this fodder added to value of increase of live weight, and divided by the number of bushels fed, gives a value received for mangels of five and one fifteenth cents per bushel of sixty pounds. This would give a value of one dollar and seventy-three cents per ton. These figures are certainly not calculated to cheer one on in the hot sun of hay time, as with aching back he bends again to weeding and thinning this watery food. Nor do they afford much inspiration for him when he lags and aches in pulling and carting. Nor more encouraging is the reflection that it is forty-five tons of water for five of food that he lugs basket by basket from his cellar, chops, rebaskets, and distributes at a painfully slow rate for the results achieved. These root crops, mangels, and turnips are not and will not become profitable staple crops for animals in this country. Upon this question of root growing and feeding we have but little in common with England. Even there the results of feeding experiments give to them no better results than I have noted. The extent of this paper will not admit of a review of foreign experiments in root feeding; but they are not encouraging to a people that cannot feed the roots on the spot of their growth, owing to climatic influences. Chemistry does not attach a higher feeding value to the roots fed during the past three years than the result I have attained; and, in fact, the recent discovery that nearly one half of the nitrogen of root crops heretofore considered albuminoids is really in what is now presumed to be non-flesh forming compounds, assigns to them now a value hardly as high as obtained in my results, certainly no higher."

To test the effect and value of shelter as a substitute for food, four cows were divided into two lots of two each. Each lot was fed alike for the entire time. Both lots were kept in cased stalls for eleven days to get their flow of milk under the same conditions. Lot 1 gave per day $30\frac{9}{10}$ pounds. Lot 2 gave per day $30\frac{8}{11}$ pounds. Second period, lot 1, in open barn, yield per day for twenty-eight days, $28\frac{7}{23}$ pounds. Second period, lot 2, in cased stalls, yield per day for twenty-eight days, $28\frac{10}{23}$ pounds. The gain in milk flow in favor of cased stalls is, in this instance, only three fourths of one per cent.

Lot 1, pounds of milk required to make a pound of butter, 29.5. Lot 2, pounds of milk required to make a pound of butter, 20.5. Average temperature for this period—from December 9 to January 2—morning and night, in open barn, 28.3°; average temperature for same period, in cased stalls, 44.4°. Lot 1 consumed in 23 days, 638 pounds of hay, and 815 pounds of corn-fodder, and 5 pounds of corn meal daily; lot 2 consumed in 23 days, 627 pounds of hay, and 825 pounds of corn fodder, and 5 pounds of corn meal daily.

The cows were exchanged places from January 2, lot 1 being put in cased stalls, and lot 2 in open barn.

Lot 1 weighed, January 2, 1,955 pounds; lot 2 weighed, January 2, 1,840 pounds. Lot 1 consumed to February 3, or 32 days, 852 pounds of hay, and 802 pounds of stover, and grain as before; lot 2 consumed to February 3, or 32 days, 967 pounds of hay, and 905 pounds of stover, and grain as before. Lot 1, milk per day, 31 3.32 pounds; milk required to make a pound of butter, 33.2 pounds. Lot 2, milk per day, 28 pounds; milk required to make a pound of butter, 21 pounds. Weight of lot 1, February 2, 1,990 pounds; average temperature of open stalls, 32.6°. Weight of lot 2, February 2, 1,875 pounds; average temperature of cased stalls, 46.7°.

The change of milk-flow is very considerable during this period, and amounts to 11.3 per cent. in favor of warm stables. The amount of food consumed has suffered a radical change. Where there was but one pound difference before, we now note a consumption of 218 pounds more by cows in open barn. I had conjectured that the amount of butter from a given amount of milk might be less in cold weather than in warm. The figures above taken do not corroborate this view. The result may, for some unseen reason, be accidental. Care was taken in method of setting, temperperature, temperature of churning, etc., to have the two lots of milk and cream from them carried to butter under precisely similar conditions. The weight of the cows do not seem to have been affected by conditions of temperature.

Lot 1, in open barn, milk per day for 21 days, 27.5 pounds. Lot 2, in cased stalls, milk per day for 21 days, 28.5 pounds. Temperature of open stalls, 33°; of cased stalls, 44.2°.

Lot 1 consumed, for 21 days, 635 pounds of corn-fodder, 635 pounds of hay, and meal as before. Lot 2 consumed, for 21 days, 628 pounds of corn-fodder, 628 pounds of hay, and meal as before.

It will be noticed that lot 1 is again, in this period, in the open stalls, and lot 2 in the cased stalls, as at the first test, and also that the relative milk-flow and food-consumption are as they were at the first test. These figures corroborate the correctness of the difference noted after the first change and those taken on previous winters, and particularly in regard to effect temperature on milk-flow.

In putting the pair of cows from warm to cold quarters they lose, and in putting the other pair from cold to warm quarters they gain. The gain per pair will then be but one half of the amount noted per two pairs, and one fourth per cow. Ignoring the relation of temperature to weight of beast and quality of cream, because as yet too uncertain to base calulations upon, and calculating the saving of food and milk per cow upon the basis found, and we have a saving of 2.8 per cent. of milk per day, and .8 pounds of stover, and .9 pounds of hay. Calculating the milk at three cents per quart, stover at six dollars per ton, and hay at twelve dollars per ton, and we have a daily saving of one and one third cents per cow, providing the cow gives an average of fourteen pounds of milk per day. This saving for one hundred and twenty of our coldest days amounts to one dollar and sixty cents.

In the production of palm oil for soap and other commercial purposes, a residuum in the form of oil-cake is left, which thus far is not well known in the stock-food market. With a view of ascertaining its comparative value as stock-food, Professor Sanborn instituted an experiment, of which we give the following synopsis:

Corn-meal alone, milk per day 21.14 pounds. One fourth part palm-nut meal, milk per day 21 pounds. One half part palm-nut meal, milk per day 20.60 pounds. Three fourths part palm-nut meal, milk per day 19.60 pounds. All palm-nut meal, milk per day 20.25 pounds.

Milk set in like conditions for cream:

Corn-meal alone gave 6 per cent. cream. One fourth palm-nut meal gave 7 per cent. cream. Two fourths palm-nut meal gave 9 per cent. cream. Three fourths palm-nut meal gave 10 per cent. cream. All palm-nut meal gave 14 per cent. cream.

Corn-meal gave for 107 pounds of milk, 2 pounds 7½ ounces, or 43⅛ pounds of milk for one pound of butter. One fourth palm-nut meal gave, for 97 pounds milk, 2.38 pounds butter, or 40.8 pounds milk for one pound butter. One half palm-nut meal gave, for 112 pounds milk, 3.38 pounds butter, or 33.2 pounds milk for one pound butter. Three fourths palm-nut meal gave, for 94 pounds milk, 3.19 pounds butter, or 29.5 pounds milk for one pound butter. All palm-nut meal gave, for 100 pounds milk, 4.06 pounds butter, or 21.3 pounds milk for one pound butter.

As a companion test to that of the value of roots as food for steers an experiment was originated to obtain their value as a milk producer, with the following result:

Lot 1, two cows ate, in twenty-seven days, 670 pounds of hay and 847 pounds of stover, (corn fodder.) Lot 2, two cows ate, in twenty-seven days, 55 pounds mangels, daily, and 712 pounds hay, and 870 pounds stover for the period. Lot 1 gave per day, for these twenty-seven days, 39 pounds of milk. Lot 2 gave per day, for these twenty-seven days, 39.6 pounds milk. Lot 1 made from 196 pounds of milk 6 pounds 7 ounces butter. Lot 2 made from 203 pounds milk 5 pounds 10 ounces butter.

At the termination of the twenty-seven days the food of the two lots was changed with the following result:

Lot 1 consumed in thirty-one days 800 pounds of hay, 805 pounds of stover, and 55 pounds mangels daily. Lot 2 ate for the same period 893 pounds hay, 866 pounds stover, and no mangels. Lot 1 gave 37.7 pounds milk daily for thirty-one days. Lot 2 gave 37.4 pounds milk daily for thirty-one days. Lot 1 made from 188 pounds of milk 5 pounds 11 ounces of butter. Lot 2 made from 158 pounds of milk 5 pounds 15 ounces of butter.

To carry the test still further both lots were given the same kind of food, when lot 1 consumed, in sixteen days, 450 pounds stover and 480 pounds of hay. Lot 2 ate, in sixteen days, 462 pounds of stover and 495 pounds of hay. Lot 1 gave 39 pounds 11 ounces of milk per day. Lot 2 gave 38 pounds 5 ounces of milk per day. From this data Prof. Sanborn draws the following conclusions:

"The change in milk flow, after the first change of food, amounts, after striking the balance between the lots, to 1.45 pounds of milk per day, worth one and a half cents. The change in fodder consumption amounts to eighteen cents in value for thirty-one days, rating hay at ten dollars per ton and stover at five dollars. As to gain on butter it appears very strongly to be on the other side as the figures emphatically indicate. Lot 1, no mangels, 30.4 pounds of milk make one pound of butter. Lot 2, fed mangels, 36⅝ pounds of milk make one pound of butter.

As illustrating the value of cotton seed meal and poor hay, when compared with good hay, Prof. Sanborn furnishes the following:

"I fed lot 1, of two steers, with four pounds of cotton seed meal each, and what swale hay (poorest quality) they would eat. Lot 2 had timothy hay. Both lots were of the same age and weight—two years old and weighing two thousand pounds per pair, and the test covered seventy days:

	LOT 1.		LOT 2.
	S. hay.	*C. S. meal.*	*Timothy.*
Amount of food,	2,496.00 lbs.	560 lbs.	8,536 lbs.
Digestible albuminoids eaten,	79.87 lbs.	207 lbs.	146 lbs.
Digestible carb-hydrates,	1,239.00 lbs.	74 lbs.	1,083 lbs.
Digestible fats,	31.20 lbs.	49 lbs.	34 lbs.
Ratio, (including both feeds of lot 1,)		1 to 5.1	1 to 12.9
Gain, (including both feeds of lot 1,)		167 lbs.	185 lbs.
Cost, (including both feeds of lot 1,)		$15 04	$26 52

"Good hay, in the above, is rated at $15 per ton, the swale, at what I paid for it, $6 per ton, and cotton seed meal at purchase price. The economy of this trial with a poor food in conjunction with an albuminous food is clearly seen in the figures.

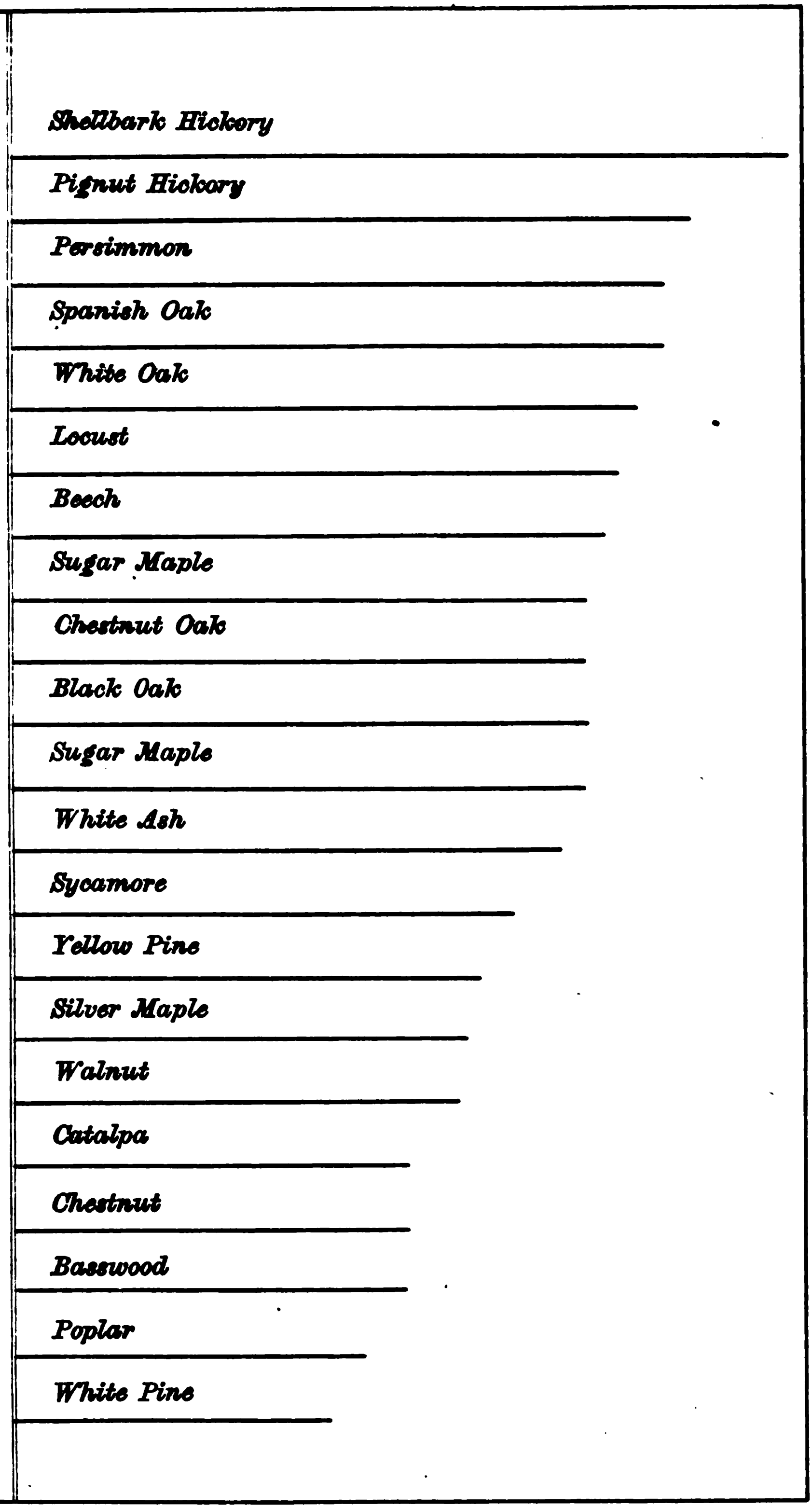
"But we may approach it in another form. Subtract the cotton seed meal at $28 per ton, its present price by the car, (and farmers should buy together, by the car,) from the cost of the timothy hay ration, $26 52, minus $7 84, and we have 2,496 pounds of swale hay, bringing, in the combination against timothy, $18 68. From this we would subtract the value of the excess of growth of the timothy-fed steers over those with swale hay and meal, which is 18 pounds, at 4 cents, or 72 cents. We now have $17 96 as the value of 2,496 pounds of swale hay as fed, or $14 24 per ton.

"By this same method of estimating the comparative value of foods, I have often made the poor foods, like straw, bring more than good hay. In the following case, by the prices prevailing here at the time of trial, (hay, $12; straw, $6; corn meal, $20; and blood, $45,) the straw gave just the same value as the good hay fed. Time, seventy days; steers, two years of age; lots of two steers each. Lot 2, was the lot above mentioned. Lot 3, ate 2,460 pounds of straw, 280 pounds of blood, and 146 pounds of corn meal, and gained 133 pounds. If the figures are changed to conform to present prices as before, then the result will be more favorable. If they are made to agree with the prices for good hay in Massachusetts, the results will be better still. The good hay at $20 would cost $35 36, and straw compound, straw at $8, (prices by car are given me by a Massachusetts farmer,) blood $50, and corn meal $30, and we have a cost of $18 99. In these combinations I have used, meat, meat scraps, ground, and fish; of course all of these foods of animals origin have been dried and ground into a meal, dried so that they will keep. The fish I fed for ninety-eight days, weighing hay and straw daily. The fish and straw or fish and corn fodder ration made more growth than the timothy hay ration.

"I may here state that I have never fed a food with straw and corn stover that gave me in efficacy so good results as fish and meal. Of the above foods, I will simply say now, that by exact trial they have proved more economical, each of them with straw, &c., than a hay ration. Combinations of other meals, corn, cotton seed, and bran, have been used with straw and corn fodder, and universally I find cotton seed meal, about three pounds of steers, will give more economical results than good hay. Ten pounds of straw, actually consumed with three pounds of cotton seed meal, will make a daily growth of one pound after the first week; cost of both, seven to eight cents daily."

In the seventeenth quarterly report of the Board, Prof. W. H. Jordan reports the following experiments, to test the comparative value of cornmeal, cotton seed meal, to which we append the remarks of Prof. Jordon, in relation to the general bearing of the test.

"The farmers of Pennsylvania fatten annually a large number of cattle. The principal food made use of for this purpose, beside coarse fodder, is cornmeal. Some farmers feed the cornmeal nearly pure, others mix with



COMPARATIVE WEIGHT PER CUBIC FOOT (DRY) OF 21 KINDS OF WOOD
GROWN IN PENNSYLVANIA.
10th Census.

it considerable oatmeal, wheat bran to a limited extent, cotton seed and linseed meal. Opinions differ as to what food or mixture of foods is wisest. So far we have very little but opinion, if we except the experimental work of the Germans.

"Leaving the presentation of the scientific side of the question until later, it can be said that one practical inquiry is of great importance, viz: Can farmers profitably purchase the highly nitrogenous cattle foods that are for sale in our markets in order to combine them with the corn and coarse fodder produced on the farm? Theories based on scientific investigation would answer the inquiry in the affirmative, so far as it is a question of proper combination of food ingredients, and so of an economical use of the material consumed. Of course the variable relative prices of these various food stuffs is something of which science can take no account, and the farmer must decide, from year to year, what he can or cannot afford to purchase. The great underlying principles in all practice in cattle feeding are those that determine the proper amounts and relation of nutrients in the ration, and these principals once understood it only remains for the farmer to purchase or produce these nutrients in the cheapest possible form.

"As in the case of early and late-cut hay, experiments have been conducted at both the Eastern and Central Experimental Farms. The number of steers fed, and the precautions in feeding and weighing were the same as in the experiments on hay. A ration of cornmeal and cornfodder has in each case been compared with one composed of cornmeal, cotton seed meal and cornfodder; in the latter ration the cornmeal and cotton seed meal were mixed in the proportion of one hundred pounds of the former to forty pounds of the latter.

"The results of the experiment at the Eastern Farm are as follows:

Tables Showing Results of Experiment at the Eastern Farm on Feeding Fattening Steers.

First Period, (*55 days.*)

	Steers 5 and 6. Cornmeal alone.	Steers 7 and 8. Mixture of cornmeal and cotton seed.
Date of beginning,	December 15	December 15
Date of ending,	February 9.	February 9.
Weight of steers, December 15,	2,110 lbs.*	2,110 lbs.*
Weight of steers, February 9,	2,220 lbs.	2,336 lbs.
Total gain in weight,	110 lbs.	226 lbs.
Total quantity of cornfodder eaten,	674 lbs.	833 lbs.
Cornfodder eaten per day,	12.3 lbs.	15.1 lbs.
Total quantity cornmeal eaten,	1,660 lbs.	1,078 lbs.
Cornmeal eaten per day,	30.2 lbs.	19.6 lbs.
Total quantity cotton seed meal eaten,		431 lbs.
Cotton seed meal eaten per day,		7.8 lbs.

Second Period, (*42 days.*)

	Steers 5 and 6 Mixture of cornmeal and cotton seed.	Steers 7 and 8. Cornmeal alone.
Date of beginning,	February 16.	February 16.
Date of ending,	March 30.	March 30.
Weight of steers, February 16,	2,254 lbs.	2,368 lbs.
Weight of steers, March 30,	2,404 lbs.	1,510 lbs.
Total gain in weight,	120 lbs.	152 lbs.
Total quantity of cornfodder eaten,	419 lbs.	524 lbs.
Cornfodder eaten per day,	10 lbs.	12.5 lbs.
Total quantity of cornmeal eaten,	830 lbs.	1,245 lbs.
Cornmeal eaten per day,	19.8 lbs.	29.7 lbs.
Total quantity cotton seed eaten,	333 lbs.	
Cotton seed eaten per day,	7.9 lbs.	

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* All the weights given in these tables refer to two steers.

"A summary of the two periods shows the results to be as follows:

	Corn meal alone.	Mixture of corn meal and cotton seed.
Total quantity cornfodder eaten,	1,198 pounds.	1,252 pounds.
Cornfodder eaten per day, (97 days,)	12.3 pounds.	13 pounds.
Total quantity corn meal eaton,	2,905 pounds.	1,908 pounds.
Corn meal eaten per day,	30 pounds.	19.7 pounds.
Total quantity cotton seed eaten,		764 pounds.
Cotton seed eaten per day,		7.9 pounds.
Total gain in weight,	262 pounds.	376 pounds.
Cost of food,*	$46 57	$47 04
Cost of food per pound of increase,	17.7	12.5 cents.

The superintendent of the Eastern Farm states in his report that steers five and six were inferior in growing capacity to steers seven and eight. During the "first period," when the former lot was fed on the corn meal ration, their gain was very unsatisfactory, and much inferior to the gain of steers seven and eight that ate the mixture containing cotton seed. When, however, the rations were changed about so that the poorer steers received the cotton seed and corn meal, their increase in weight was equal to that of the better lot of steers that were given pure corn meal.

The next table shows the results of the experiment at the Central Farm.

Table Showing Results of Experiment at Central Farm in Feeding Fattening Steers.

	Steers No. 5 and 6, corn meal alone.	Steers No. 7 and 8, mixture of corn meal and cotton seed.
Date of beginning,	Jan. 7.	Jan. 7.
Date of ending,	April 1.	April 1.
Weight of steers, January 7,	1,835 lbs.	1,939 lbs.
Weight of steers, April 1,	2,010 lbs.	2,200 lbs.
Total gain in weight,	175 lbs.	261 lbs.
Total quantity of cornfodder eaten,	840 lbs.	1,436 lbs.
Cornfodder eaten per day, (84 days,)	10 lbs.	17 lbs.
Total quantity of corn meal eaten,	2,626 lbs.	1,344 lbs.
Corn meal eaten per day,	31.3 lbs.	16 lbs.
Total quantity of cotton seed eaten,		672 lbs.
Cotton seed eaten per day,		8 lbs.
Cost of food,	$43 37	$38 15
Cost of ration per day,	0 52½	0 45$\frac{8}{10}$

In this case the rations were not changed about, so as to give the mixture of corn meal and cotton seed to Nos. 5 and 6. But in order to determine the amount of error introduced by the different capacities for growth of the two lots of animals, the steers were fed alike for four weeks previous to beginning the experimental rations. Steers Nos. 5 and 6 gained 135 pounds during the four weeks, and steers Nos. 7 and 8 gained 194 pounds, or the two lots gained in the ratio of 100 to 144. While the experimental rations were fed, the gain of steers 5 and 6 was to the gain of steers 7 and 8 as 100 to 149. Or the relative gain of the two lots was the same when fed alike, and when fed the rations that were put to a comparative test. Now one lot ate about 32 pounds of corn meal per day, and the other lot only 16 pounds of corn meal, and 8 pounds of cotton seed; that is, 1 pound of cotton seed when combined with the other foods was able to replace 2 pounds of corn meal.

The superintendents of both farms report themselves as favorably impressed by the practical results of adding cotton seed meal to the ration of the steers that were being fattened. Looked at from the standpoint of profit, the outcome with the particular animals fed, and with relative prices as they are at present, was favorable to the use of the cotton seed.

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*In estimating the cost of the food, the fodder is valued at $5 per ton, the meal at one and one half cents per pound, and the cotton seed at $40 per ton.

The Scientific Side of Cattle Feeding.

To show that with the particular circumstances and conditions involved in the experiments here reported, one method of feeding was productive of more satisfactory results than another, would amount to very little. Like circumstances and conditions may never occur again at the college farms or elsewhere. The relative supply of cattle foods and their relative prices change from year to year.

To establish a fact with regard to the laws of animal nutrition, or some principle involved in all practice, would be to secure a lasting benefit. We need not so much to know that under certain conditions of practice certain results follow as to know the reasons why, or the principles involved. For instance, granting that a mixture of corn meal and cotton seed as fed in these experiments produced as much growth as a larger amount of pure corn meal. This may not be true simply because cotton seed and corn meal were fed together, but because the mixture furnished a more efficient combination of food ingredients than was the case with corn meal alone. It may be a question of the economical use by the animal organism of certain quantities of protein and carbo-hydrates mixed in certain proportions rather than cattle foods having certain names. If this be true, then we are not shut up to corn meal and cotton seed as the only means of securing the desirable combination, but can use any cattle foods that will furnish the ingredients we desire in the proper quantities and proportions. It must be remembered that protein, for instance, is a constituent of all cattle foods, and that it may be of more importance that we give an animal a certain quantity of it in a digestible form accompanied by proper amounts of other compounds, than that we supply it in any particular kind of food, whether it be hay, corn meal, wheat bran, or cotton seed. From the data given on previous pages, let us see what were the real differences between the rations fed in the experiments reported.

Composition of the Various Food Stuffs Used.

The composition of the hays fed can be seen on previous pages. The composition of the corn fodder, corn meal, and cotton seed, can be safely assumed from the average of a number of analyses of these food stuffs. No analyses were made of the particular samples used, because of entire lack of time.

	Water.	Ash.	Protein.	Crude fiber.	Other carbo-hydrates.	Fats.
	%	%	%	%	%	%
Corn fodder, (stover,)*	15	4.2	3	40	36.7	1
Corn meal, (Dent corn,) av. 19 analyses	11.13	1.48	10.49	1.86	70.20	4.84
Cotton seed meal,† decorticated, av. 3 analyses, ...	7.70	7.04	42.79	6.36	19.76	16.35

The above table shows, that if a hundred pounds of cotton seed be fed to an animal, there would be given 42.79 pounds of protein. Not all of this protein could be used, as only a certain percentage of it would be digested. A cattle food is valuable, not because of what it contains, but because of what can be digested from it. Very careful and elaborate investigation has shown that, with the exception of roots, no ingredient of any cattle food is ever completely digested. Moreover, by a large amount of experimenting, it has been ascertained what are the approximate percentages of the constituents of the various foods that are digested, these digestion coefficients varying with the kind and quality of the fodder. The following table shows those applying to corn fodder, corn meal, and cotton seed:

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*From Mentzel u. Lengerke's landw. Kalender, 1882.

†The sample fed was a fine one, procured from Alexander & Co., Bellefonte, Pa.

	Protein.	Crude fiber.	Other carbo-hydrates.	Fats.
Corn fodder,*	37	.....	.....	30
Corn meal,†	79	62	91	85
Cotton seed meal, (decorticated,)‡	85	.....	95	88

By multiplying the total quantities of the several ingredients of the cattle foods, with which we are dealing, by the percentages given in the last table, we get the following results for the percentages of *digestible nutrients*. The figures previously given for the hay, are brought forward for the sake of convenience.

Laboratory number.		IN 100 PARTS THERE ARE DIGESTED OF		
		Protein.	Carbo-hydrates.	Fats.
	Corn fodder,	1.1	§37	.3
	Corn meal,	8.33	65	4.11
	Cotton seed meal,	36.27	18.77	14.38
9	Timothy hay,	3.95	44.62	1.04
10	Timothy hay,	2.58	45.86	1.02
7	Timothy hay,	2.86	46.02	.96
8	Timothy hay,	2.16	46.23	.97

We are now prepared to calculate the quantities of digestible nutrients actually consumed by the steers when fed on the experimental rations.

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* The digestion coefficients of the "crude fiber" and "other carbo-hydrates" are not given, for it has been found that in coarse fodder, what is digested out of both of these is about equal to the total quantity of carbo-hydrates, excluding the crude fiber, or what is given in the table as "other carbo-hydrates."

† From averages given in Armsby's Manual of cattle feeding.

‡ From Biederman's Central blatt Jahr. 10, page 32.

§ The figures in this column equal the sum of the digestible crude fiber and other carbo-hydrates.

Early and Late Cut Hay.

KIND AND QUANTITY OF RATION FED A SINGLE ANIMAL.	Total dry matter, lbs.	DIGESTIBLE.			Nutritive ratio.
		Protein, lbs.	Carbo-hydrates, lbs.	Fat, lbs.	
Eastern Farm.					
1. Early cut hay, (No. 9,) . . . . 15.2 lbs.	13.3	.60	6.78	.16	
Corn meal, ... 6 lbs.	5.34	.50	3.9	.25	
Total, ...	18.64	1.10	10.68	.41	1:10.6
2. Late cut hay, (No. 10,) . . . . . 14.6 lbs.	12.8	.38	6.70	.15	
Corn meal, ... 6 lbs.	5.34	.50	3.9	.25	
Total, ...	18.14	.88	10.60	.40	1:13.2
Central Farm.					
3. Early cut hay, (No. 7,) . . . . . 17 lbs.	14.9	.49	7.82	.16	
Corn meal, ... 3.5 lbs.	3.11	.29	2.27	.15	
Total, ...	18.01	.78	10.09	.31	1:13.9
4. Late cut hay, (No. 8,) . . . . . 13 lbs.	11.4	.28	6.00	.13	
Corn meal, ... 3.5 lbs.	3.11	.29	2.27	.15	
Total, ...	14.51	.57	8.27	.28	1:15.8

Corn Meal and Cotton Seed Meal.

KIND AND QUANTITY OF RATION FED A SINGLE ANIMAL.	Total dry matter, lbs.	DIGESTIBLE.			Nutritive ratio.
		Protein, lbs.	Carbo-hydrates, lbs.	Fat, lbs.	
Eastern Farm.					
5. Cornfodder, ... 6.2 lbs.,	5.27	.07	2.29	.02	
Corn meal, ... 15 lbs.,	13.34	1.25	9.75	.62	
Total, ...	18.59	1.32	12.04	.64	1 : 10.3
6. Cornfodder, ... 6.5 lbs.,	5.52	.072	2.40	.02	
Corn meal, ... 9.9 lbs.,	8.80	.72	6.44	.41	
Cotton seed meal, ... 4 lbs.,	3.60	1.46	.75	.58	
Total, ...	18.01	2.25	9.59	1.01	1 : 5.4
Central Farm.					
7. Cornfodder, ... 5 lbs.,	4.25	.06	1.85	.02	
Corn meal, ... 15.7 lbs.,	14.0	1.31	10.2	.64	
Total, ...	18.25	1.37	12.05	.66	1 : 10.
8. Cornfodder, ... 8.5 lbs.,	7.03	.09	3.14	.03	
Corn meal, ... 8 lbs.,	7.11	.67	5.20	.33	
Cotton seed meal, ... 4 lbs.,	3.69	1.46	0.75	.58	
Total, ...	17.83	2.22	9.09	.94	1 : 5.1

In another table let us place together the total quantities of digestible nutrients fed per day and per animal to each of the eight lots of steers, as shown in the two previous tables; also the nutritive ratios and the gain per day, so that we may discover, if possible, what the relation is between gain and food.

	Total dry matter.	DIGESTIBLE			Nutritive ratio.	Grain per day.*
		Protein, lbs.	Carbo-hydrates, lbs.	Fat, lbs.		
	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.
1. Ration containing early cut hay, . . .	18.64	1.10	10.68	.41	1:10.6	1.57
2. Ration containing late cut hay, ...	18.14	.88	10.60	.40	1:13.2	1.20
3. Ration containing early cut hay, . . .	18.01	.77	10.09	.31	1:13.9	1.0
4. Ration containing late cut hay, ...	14.51	.57	8.27	.28	1:15.8	0.42
5. Corn meal without cotton seed, . . .	18.59	1.32	12.04	.64	1:10.3	1.35
6. Corn meal with cotton seed, ...	18.01	2.25	9.59	1.01	1: 5.4	1.95
7. Corn meal without cotton seed, . . .	18.25	1.87	12.05	.66	1:10	1.04
8. Corn meal with cotton seed, ...	17.83	2.22	9.09	.94	1: 5.1	1.55
The German standard, per 1,000 pounds live weight, ...	26.0	2.5	15.0	.50	1: 6.5	–

One main and important difference to be noted in the above rations, is the relation between the quantity of digestible protein, and of the digestible carbo-hydrates. It is seen that in rations six and eight, there is only the equivalent of a little over five pounds of digestible carbo-hydrates to each pound of digestible protein, while in rations two, three, and four, the ratio is very different, the digestible carbo-hydrates being present in nearly three times as large a relative quantity. Not only the relative but the absolute quantities of digestible nutrients differ very much in the various methods of feeding in the experiments, in one ration there being only about 0.6 pounds of digestible protein, and in others as much as 2.25 pounds. The variations in the amounts of digestible carbo-hydrates are very much less. It remains for future investigation to determine whether the increase in gain, that in these experiments has accompanied an increase of nitrogenous material in the food, is accidental or not. All present well-substantiated theories indicate that production, whether of meat, milk, or work, is largely dependent upon the so-called protein of the food, and that the relation in amount of this protein to the amount of other nutrients determines largely the profits of feeding. The position taken is, that if too little nitrogenous material is contained in the combination of food stuffs used, it would be necessary to feed more than the animals could possibly consume in order to furnish sufficient protein to do the desired work, while if the ration be too highly nitrogenous, a waste of material occurs, and the animal fails to use the nutrients given for the purposes of growth or production of milk. In the rations discussed here there is in no case, probably, an excess of protein, while in some cases it seems as if there was a deficiency.

We believe that the question of the use of the nitrogenous waste products, offered for sale in our markets, is one of great importance. It would be well for farmers to consider whether they cannot often realize a greater profit by purchasing these and selling the products of the farm, than by feeding the latter.

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* These figures refer to the gain of single animals weighing throughout the experiment an average of about a thousand pounds, the first two lots weighing a little less, and the last two a little more.

AGRICULTURE AND THE DUTIES OF LOCAL AGRICULTURAL SOCIETIES.

By W. S. ROLAND, *Member from York.*

Read at Annual Meeting.

With the creation of man, followed agricultural pursuits—for we read in Genesis: "And the Lord God took the man, and put him in the garden of Eden to dress it and to keep it;" so in like manner, I could go on and quote many other wise sayings, to show that in all times since the Creation, in all countries, and amongst all nations, the first steps of the people from a state of barbarism towards civilization and organized society, has been reached through a knowledge of agriculture. The masses of the people in all periods of the world, and at all times, from the highest to the lowest, have been agriculturists, and the most remarkable names in American history, have been found among those who were practical farmers, and devoted to agriculture. General Washington, after having won for us our National Independence, again returned to his farm at Mount Vernon, and in a letter to Sir John Sinclair, wrote: "I know of no pursuit in which more real and important service can be rendered to any country, than improving its agriculture, and its breed of useful animals." Jefferson, Adams, Jackson, Harrison, Clay, Webster, and a host of others, great and distinguished, always found time from their arduous public duties, to give to agricultural pursuits a portion of their labors. Agriculture is the rock upon which is built the nation's wealth; it is the foundation upon which civilization and society rest; it is the surest road and safeguard to a nation's prosperity and liberty; "it is the most universal of all arts, the parent of manufactures and commerce, and the basis of all other industries, and without which all others must decay and perish." A United States Senator, in a speech delivered a few years ago in the Senate chamber, used the following expressive words:

"What we owe to American Farmers.

"From the time of the landing at Jamestown and Plymouth Rock, the American farmers have always constituted the advance guard, and the largest part of that grand army of progress and liberty, which, in its triumphant march in the face of dangers, trials, privations, and the cruelty of the savage, has gradually subdued forests, crossed rivers, and climbed mountains, until civilization, society, churches, schools, and happy homes have been established from ocean to ocean, and from the lakes to the gulf.

"The American farmers have laid the foundation of an empire on this continent, destined, largely through their efforts, virtue, industry, courage, and devotion to free government, to surpass in substantial glory, grandeur, wealth, progress, and prosperity all the nations of this world, and the achievements of all history.

"Our liberties were conquered, and our Constitution made mainly by farmers, and to them in any and every great crisis we must look to the safe-keeping and protection of both.

"As a rule, the agricultural classes have always been devoted to liberty, peace, and good order, and the friends of established society, and the enemies of disorder, wrong, change, violence, and unjust revolution; they constitute the reserve forces and conservatism in all governments, particularly in ours."

I also quote from the Centennial address, 1876, of Hon. Fred'k Watts, late United States Commissioner of Agriculture, as follows:

" What of the spirit of independence if our surroundings were the threatenings of poverty? What of the fundamental law of the land, if for our lives and property we had not constantly in view the stimulants which the productive character of the earth affords? What of the speculative and roving business of the merchant upon the high seas of the world, if he had not the products of agriculture to deal with? What of the ingenuity and skill of the manufacturer, if his daily bodily wants were not supplied by the farmer? What of the value of freedom of thought and speech, if it were not for the marvelous proceeds of the earth, and the science and skill by which they are produced?

" One hundred years ago this land was comparatively a barren waste, the habitation of savages and wild beasts, while now it is a beautiful garden; the field of the farmer, the home of the scientist, the city of the merchant, the office of the student, and the shop of the mechanic, where all work together in the prosecution of a common purpose to promote wealth, the health, and the happiness of each other, and the honor of our much-loved comntry."

Duties of Local Agricultural Societies.

There are many things undertaken by individuals who very often fail in realizing any good results; but when the same duties are undertaken by a number of persons combined together, their united efforts generally and often easily accomplish the object in view; thus conclusively proving the rule, that when individual thought and action fail in any enterprise, good results will follow a united effort, and by thus acting together, will achieve great ends. It is with this spirit that the leaders in the organization of agricultural societies should labor for success, for in union only is strength, and it is essentially important that in organizing and building up an agricultural society every one interested in its welfare and success should uphold and give aid to the enterprise, and the individual and combined efforts of all who may be interested should not only be used to advance the great objects of the society, but they should also help to give it strength, respectability, and a good standing in the neighborhood. When we reflect upon the vast amount of good that has already been done and can yet be accomplished through the means of such societies, when we consider the wide field that is still open for improvement, and when we notice with pride and pleasure the advancement that is made in this direction, as is seen at the annual fairs, we feel encouraged, and fully recognize the fact, that it is within the power of all such associations to materially improve and advance the agricultural, horticultural, and mechanical interests of the country, and not only for the benefit of those of the present day but likewise for those who come after us.

It should be the aim and study of the members of a local society to strive to excel similar organizations; its possibility of usefulness should be great, and its sphere of influence large and felt throughout the country. It should, by all possible effort, bring to its aid men and women large in experience, and who are known for their liberality and public spirit, and who are good workers and thinkers in the field of agriculture and household affairs. All such who may thus be actuated by a public spirit should work separately and together, in and out of season, by personal effort, by the pen, and by all such friendly and liberal inducements as may aid to bring together all classes of persons, each and every one bringing something useful to the place of the exhibition, and success will surely follow. Of the persons who usually attend fairs—they may be divided into two classes; one of these classes may be termed partisans, who believe the exhibition should be strictly of an instructive character, and the sole object should be to get useful information. The other class take quite a different view. They go for recreation and amusement, and take with them their wives and little ones, to see other people's wives and little ones. The fair is to them their annual holiday. The first abhors the race-course, the second thinks it is the best thing on the ground. Perhaps it would be best for the general interests of a society to recognize both of these views, and to reconcile both classes as much as possible; the managers should appoint separate committees on instruction and on amusements. More attention should be shown to exhibitors. In the early years of agricultural fairs printing was not cheap, and periodicals were not common, as now. Then people could learn most from what they could see; now they can learn more from what they read, than from what they see. Then societies held fairs and announced the premiums; that was deemed sufficient, and nothing more was expected, but it is not so now. Exhibitors at fairs now-a-days expect that more attention will be shown, and intelligent notice will be taken of their exhibits, and the society should look well to it, that merit is duly respected and honored.

There are persons who do not care much for the premiums, and who would exhibit if the excellencies of their article were properly noticed and respected, and for this purpose, besides the general committee, there should also be a Committee on Special Merit, whose duty it should be to carefully examine and report on the special merits of articles that may be referred to them. For instance, by way of illustration, John Jones exhibits a Bartlett pear weighing four ounces, and John Smith exhibits one weighing five ounces; the general committee awards the premium to Smith, and it is reported, first premium for Bartlett pears to John Smith. The public cares little for this, and, as a general thing, the reports are not read. Smith soon finds this out, and says to himself: " Of what use to me is my fifty cents, premium; my time is lost and my pears are spoiled." Now, if the Committee on Special Merit, after examining the pears and finding them excellent, would say: " The pears exhibited by John Smith are large and fine, with a clean skin, rosy cheek, real beauties, rare specimens, flesh juicy and melting, sweet and slightly perfumed, and weigh —— ounces," then there would be something that the public would notice, and those who exhibit, regardless of the premium, would have special inducements to take their articles to the fair. Newspapers would gladly publish these reports, and they woud be widely circulated without cost to the society. But in order to effectually carry out such a system, it would possibly require a select committee of well-informed persons, and if it did, it would be cheap even if paid for. Again, premiums are offered for improvements in soil, stock, machinery, and household affairs, and to encourage good taste generally, and yet we sometimes enter fair grounds and see nothing that is comely to look at. The plot is shapeless and nasty, the fences tottering, and the sheds and buildings filthy and dilapidated. To insure permanent success there must be—

1. An active, intelligent, and enterprising board of managers.

2. The selection of grounds eligibly located and kept nice and clean; an abundance of good water, plenty of shade trees, and otherwise improved with objects attractive and pleasing to the eye.

3. The buildings should be commodious, comfortable, and conveniently arranged.

4. During the continuance of a fair good order should at all times be

maintained, and no intoxicating beverages or anything immoral should be allowed on the grounds.

5. The premiums should be sufficiently liberal, for at least in part, to compensate exhibitors for the risk they run in exhibiting live stock and perishable articles.

6. A portion of the grounds, if at all practicable, should be set apart for experiments connected with agriculture and horticulture.

7. There should be a building known as the museum of the society. This building should be a store-house, abounding with inestimable treasures of wisdom and knowledge, and should contain a library of useful agricultural, horticultural, and mechanical books and periodicals; specimens of the soil and minerals of the county; samples of all kinds of fertilizers, and of all kinds of wild and cultivated products of the farm; specimens of every kind of birds and insects that are injurious on a farm, in the orchard, and the garden.

It is also suggested that the society, through properly constituted committees, should consider and report on the best varieties of shade trees and shrubbery adapted for towns, at country villas, and along the highways; also, on the subject of cattle, hogs, dogs, and poultry running at large in towns and country.

COUNTY AGRICULTURAL SOCIETIES.

At the autumn meeting of the Board, after reading the portion of the secretary's report relating to county agricultural societies, the following discussion took place:

Mr. **FORESMAN**, of Lycoming. This question of agricultural societies is an important one. What I understand by an agricultural society is that it is an exhibit of the products of the farms where the society is located. I have tried to make people believe that that is the real object of the society. If a man has got stock horses, where can he get a better advertisement than in an agricultural society? But if you don't give them money they will not come back. Horse-racing should not predominate. I had got instilled into me by visiting York county and other places that it was not advantageous to have horse-races.

In our county we are what you might call a little "fast." I encouraged the agricultural society to let us try it; I said I was at York county last year and ten thousand people were there; they stopped horse-racing and people turned out better. But the people pressed us so hard that we had nothing to do this time but to have one. "Why can't you get up a race?" they said. I was on the committee: I said, "Let's get up a race to please these people." I had some of my friends put on their driving horses; but our finances run rapidly down; we had scarcely enough to pay the expenses of the fair. After this the president of the society said, "I am going to have a horse race on my own hook." He raised fifteen hundred dollars. I was foolish enough to give fifty dollars. I was morally opposed, of course, [applause,] so when I left home the president said to me, "You had better pay your fifty dollars." After I had paid I said, "I suppose there is fifty dollars gone to the dogs." "Well," he said, "here is seventy-five dollars for it, do you want it? We have more than enough money in for entries to pay for the fifteen hundred dollars. Thousands of people are paying fifty cents at the gates to get in." Now, that is the kind of people we are. It is not very creditable. I expect to make one hundred dollars. They are making plenty of money at the gate. That seems to be the difficulty with us, but it is not so in York and other counties. That is one reason why I would like people to improve breeds of horses and exhibit them. I say we should have a track for them to exhibit on. But this thing of horses coming from all over the State—I don't believe in that.

Hon. JOHN H. EWING, of Washington county. Though a member of the agricultural society of this county for forty odd years or more, I have not had opportunity of knowing exactly the object for which this board was originally formed; therefore, I cannot speak in reference to that, but I take it for granted that the great object was the improvement of agriculture, that this great country in time may supply the world, you might say, because she has the surface and soil, with agricultural productions, and in that way give to the people that happiness which must necessarily follow every country which adapts itself for the general improvement of the country, and the general progress of mankind. Now there is no country in the known world that has had the progress of the United States, and the progress within the last ten years has been beyond any precedent known anywhere. Now I attribute a great deal of this to our general meetings in societies and organizations in the counties, which give an impulse to whatever the soil is calculated to produce. But what moved me was the sentiment of the last gentleman. I don't concur in it at all. If he wants to get all the gamblers and thieves together, why, let him have horse races. It was not for the purpose of making money that we organized in 1829, fifty-three years ago; I don't recollect exactly, but that society was not organized for making money. In Article 4 it was stated that the citizens of the county should have every facility that could be given that they might see the improvements and advancements in agriculture in [from] every point of view. They could not run here and there to see all the machinery that you see our ground covered with, and that is of advantage to the farmer. That is the object, that they might have an opportunity which they could not otherwise have; and I would like to know where the advantage would be by having some kind of a show that would bring the people together—that would add horse-racing. It is human nature to be fond of horse-racing, and I may say of gambling also. The improvement made by the introduction of that kind of stock, which it would be necessary to have in order to compete in horse-racing—I would ask how far would that advance the state of agriculture in the country? They are not stock calculated for the farm; they would be no use at all. When the object is directed particularly towards the advancement of the farmer, why, let them raise some stock and bring them to the show, and see how they are fitted for the purposes of farming. Though I have not, perhaps, been over the country as much as many of you gentlemen, I know that the improvements made in different counties in these societies have been very great, but, sir, I tell you this, that every society that has directed its attention to horse-racing has gone down, and for the very reason that there is nothing but fun and frolic, and no advancement in agriculture. What we want is the improvement of our soils. We want the machinery to do it; we want to know the modes of doing it; we want to know the grasses that suit certain soils. Why, sir, we pride ourselves on being among the first in the State, yet we have scarcely got a good farmer in the county. We don't half farm. We could raise double the amount if we would farm better. We have too much land, and therefore, it is that it advances slowly, very slowly, and it will continue so as long as we have such a vast territory uninhabited in the United States. Therefore, let us set the example, as far as we can in the production of every article that is necessary to every family in the country—the different kinds of grain, and everything of that character. Why, sir, in the old countries they consider that if a family has a farm of twelve or fifteen acres, they have plenty. In Ireland they raise a family well on that. Now here in this country you are not satisfied unless you have hundreds, the consequence is it is farmed slovenly. I don't know one farm in this county that produces half the amount the soil is capable of producing. This is no extravagant assertion; time will show it. We should learn what is needed for the production of a particular kind of grain, and put the soil in that condition. This is a science that will require time and labor; but, if we had a few who would do it, and set the example, they would be doing a great good to mankind. I say, gentlemen, you are engaged in a good work, and I say go ahead.

Dr. **ROLAND.** I represent a county that may be said to be agricultural and mechanical. We have an agricultural society, organized in 1851, that has held some twenty-five fairs, and was only stopped from holding continuously during the war. Every fair the society has held has been, I think, to the interest of the whole community, as well as to the advantage of the society itself. Our cattle have been improved as well as our horses. Our machiney department is large, attractive, and interesting, and our agricultural products are large and interesting, and all have been improved and, in my judgment, brought up to the state in which they are now by reason of these annual agricultural fairs. I have been an officer, holding nearly every office. The society started from nothing; it has paid liberal premiums. I believe I am safe in saying that its property is worth now from fifty to one hundred thousand dollars. First we located our grounds outside of the city; they are now in the incorporate limits. We have always tolerated—not horse-racing in the term that is used—but fast walking and driving horses, mostly confined to the horses of the county. The expenses of these trots do not cost the society very much, because the fees paid for entering horses generally about pay for the premiums. We have, I am sorry to say, permitted some side-shows, but we have, as there is in every community, a good class and a class who are for fun. Both classes, we think, should have the advantage of the fair. But as regards any gambling institutions, we have none, and we have no drinking on the grounds. Even men who are intoxicated are put off the ground. We rent a certain number of booths, but if we find that they give anything intoxicating we close them right down and march them off. On the last Thursday of the fair, twenty-two thousand persons passed through the turn-stiles.

We have, besides life members and exhibitors, passes and persons driving in at the gates, so that we are safe in saying we had twenty-five thousand people. We had no trouble whatever; everybody went away pleased. And so it has been for the thirty years preceding, excluding the four years we had no fair.

Dr. **EDGE.** I agree with the sentiments of the gentleman on my right, [Mr. Ewing,] as to the effects of horse-racing on the morals of the people. It appears to be wrought in letters of light, so that all men may read them. I confess I have great sympathy for my friend from Lycoming. He seems to be in the position of two colored men who were engaged in going through their neighbor's poultry. Jim going up for the poultry, looked down, and asked Sambo if he thought it was wrong. Sambo said, "Jim, dat am a great moral question. Hand down another pullet."

MR. BEEBE. The oil regions have a reputation which is not agricultural, but we are not situated now as we were. The gentleman from Lycoming seems to be very much like the people near my town once were. The subject of pumping oil wells on Sunday was discussed very seriously. It was decided that it was a necessity. It was decided eventually upon due proof and evidence that it was a necessity; that the wages of the laborer were in force. Before that was decided it was a question that was controverted in the churches, and members who were oil producers were reined up. One good deacon concluded that as a moral question he must put a stop to it so far as his well was concerned, for the benefit of the morals of the men, supposing that they would go to church. He ordered the wells to be shut down on Sunday. They had church, but not seeing the men there, he thought he would go up and see what they were doing. They were in a shanty playing draw poker at a dollar a draw. He reprimanded them very severely, when they said all they could do was to pump oil or play draw poker. Well, that seems to be the moral condition of Lycoming county. If they have a fair they must have horse-racing. Now, I don't want you to understand that we have got beyond that. I admit that all these things are prominent. This much I can say, that it was perceived that additional wealth might be added to the country, without interfering with anything else, by stimulating agriculture; but let me say, as curious as the phases of humanity we witness, that all these classes of men with their money indorsed the one proposition, that the development of agriculture and the agricultural fair should be purely such. While they are not license people, yet so far as our agricultural fairs are concerned, there is not in Washington county any more tenacity about seeing men drunk or anything that approaches to it; there is not a better temperance town. It is true the objects of my friend from Lycoming county were contended for stoutly. All these fairs have advantages; all these societies have been organized for the development of agriculture, the improvement of stock, the introduction of fertilizers and improved machinery. Let me say one thing more. I don't know what has been the character of other fairs, but what has made it to be of interest is this: In connection with the fair, we have our county club at Franklin or Titusville, where questions such as are brought before this Board are discussed, essays read, etc., so that there has been a steady and continued improvement in agriculture. Let me say, sir, that I don't know that there was a thorough-bred animal within the boundaries of those fairs at the commencement, yet this year we had one hundred and fifty entries of Durham, Alderney, and Hereford cattle; and sheep in the same way. My impression is that in Venango county we might imitate Washington county, for we have a good county for grass, so that what I desire, what they desire, is to ascertain what is their best agriculture. My impression is that the breeding of sheep, dairying, etc., is a permanent interest; so that our labors are directed to that point.

Mr. FORESMAN. I would like to make a serious correction. I don't want to make the impression on the county of York that I am a professional gambler. My speech was intended for the purpose of bringing out the members on this particular subject. My object was to show that horse-racing men are the men who will give the money. We could not get fifteen hundred dollars in the county for the advancement of agriculture. What I said when I gave fifty dollars to the horse race was "I don't give it at all, it is a business transaction." What I want to know is whether they can raise money as readily for the purpose of a fair as for horse-racing. Now, I was born and raised on a farm, but I am identified with other business now, but I never feel happy unless identified with farmers. I have always urged this very thing in my speeches to our agricultural societies that you must not expect to run an agricultural society to make money. If we could educate the people, and it is the duty of every man to educate the people—we are being educated. The farmers of this State, of every State in the Union, are more advanced in regard to their position than they were a few years ago, and the granger, although sneered at, has been a means of educating the farmer up to the position that he is entitled to hold—and these meetings of the State Board is where you can get the people together.

At another session of the board, the subject of tickets of admission to county fairs being under consideration, the following discussion took place.

E. **REEDER**, of Bucks. As I understand this question, we want to consider it under two aspects. The one that is complained of is the improper use or abuse of tickets given out by the different county societies. The second aspect is the price that should be charged. In regard to the first part of the question, it appears the best thing to do is for each member to give the practice of his own society. We have three kinds of tickets; one is the exhibitors, for which he pays his dollar, has his name written on the back, and the name of no one else. If he wishes to have one assistant, or two assistants, the requisite number of tickets are issued, and the name of the assistant written thereon. There is another class of tickets called complimentary; but only to the directors, managers, or officers of the society, to each one for himself and family. They are also given to persons who are asked to come and serve on the awarding committees, to membrrs of the press, clergymen, and also to a very few distinguished citizens. I do not think there is any complaint, or very little, with these kinds of tickets. The third class embraces those that are sold and given up. No tickets are ever given for going out and returning. The next part of the question is the price, and that is the point upon which information is particularly desired. I would like to know whether to increase the rate paid out for premiums and increase the rate for admission, or to diminish the premiums and let the price of admission be at a low rate. I do not know whether it would be best to double the premiums, and put our price of admission up from twenty-five to fifty cents. If we cut down the price of admission we must cut down our premiums, or we are fixing the price of admission at twenty-five cents.

J. P. **BARNES**, of Lehigh. Our trouble consists in having almost all kinds of tickets. We have single admission tickets, family tickets, and member tickets. They are the principal ones issued. Our trouble has been this, we have found it to permeate two classes of tickets. First the member ticket, which entitles a memberand his family to admission during the exhibition days. Some of them use the ticket, and then dishonestly hand it to their neighbors. Of course their name is on the ticket; but the gate-keeper cannot recognize each individual. We find the same difficulty with family tickets, which we sell for one dollar. They are supposed to be good for an entire family during the entire fair, no difference how many that family may consist of. But with these tickets we find the same trouble. One family comes to the gate one day with the ticket, and the next day another family, and so on until that ticket is wofully missused. We find that one family will go in on such a ticket, and that then one of the members of the family will pass it out through the fence for the admission of another family, and we believe that in some instances thirty or forty persons have been admitted on one ticket in a single day. Now, how can this be remedied. Of course, the privilege is taken that when another person uses the ticket of a member of the society the ticket is forfeited for that exhibition; but this very seldom is done. We had thought of obviating that matter at one time by selling a package of tickets at a reduction, and having one taken up whenever a person enters at any of the gates. We found that the difficulty consisted in this: Speculators would come in and buy a lot of tickets at the reduced rate and sell them out again at less than the price of a single admission.

I find there is but one plan to overcome this difficulty, that you issue but one single ticket to members, to families, and to individuals, and that ticket must be taken up whenever they enter the grounds. Then the price ought to be regulated accordingly. That is the only way I know of to remedy the matter. But, by this practice, how can you suit the members? They say we are members of this society, and, of course, ought to be permitted to go in and out whenever we want to do so. To remedy this, would it not be a good plan to give such member a certain number of tickets, and when they are exhausted let him pay as well as anybody else? I do not know any better way. I think the price of admission should not be exorbitant, so that persons may feel disposed to enter more frequently. We have had under consideration the fixing of the price at twenty-five cents, and at twelve and a half cents up to twenty-five, but we have come to the conclusion that the latter price is about right.

Mr. WOOD, of Chester. In regard to admission, I think we find that our socities are more successful where the admission fee is small. I think, on the whole, we accomplish more.

Mr. ZERR, of Berks. This is the third year of my experience as president of our society, and I know the practice of giving out tickets, now followed, has not been beneficial. We have a considerable number of life tickets afloat that we sold in years gone by at ten dollars. I took advantage of that when the society was first re-organized and two years old. They had issued a card that any person who had attended the two exhibitions of the society theretofore held, and had purchased a member's ticket, which was one dollar, to admit himself and family during the exhibitions at those times, should only pay eight dollars, and with the ticket make up the ten dollars. They are, of course, considered life members up to the present time. My present opinion is that everyone above twenty-one years of age ought to pay for his admission. We have a large number of tickets afloat which will admit a man and the members of his family under twenty-one. I think we have over four hundred of these tickets out. From the experience that I have had, I think there is fraud practiced among those life members.

To exhibitors we issue a number of tickets for one dollar, or we sell them four tickets for one dollar, or twenty-five cents a piece. When those tickets are exhausted he is, of course, compelled to purchase more. Our tickets are twenty-five cents; children, fifteen cents or ten cents.

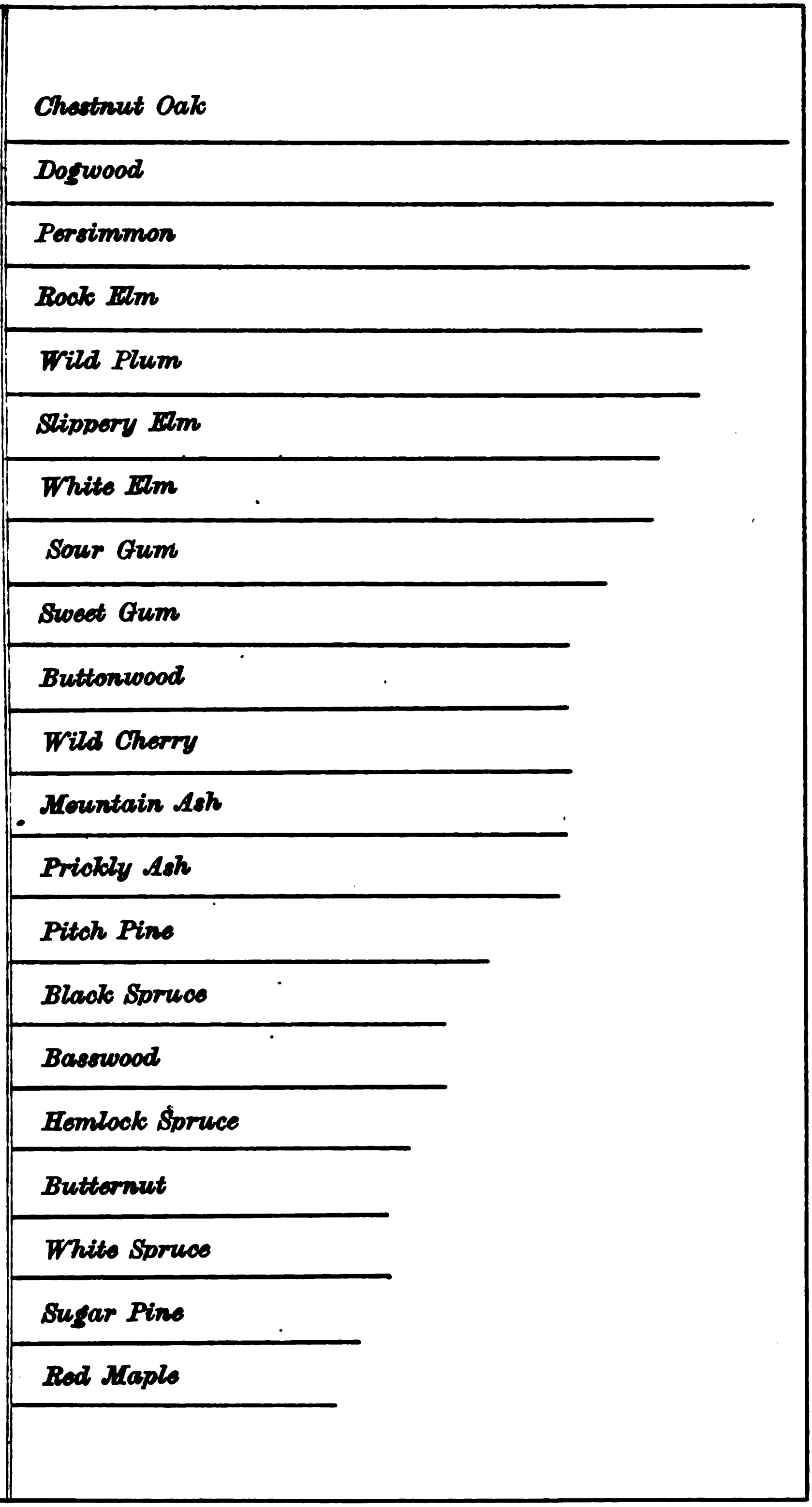
The experiment was tried the Centennial year of lowering the price of admission, thinking it would benefit the society's finances. We put the admission down to fifteen cents. The result was not satisfactory, it leaving us with a considerable amount of floating and standing debt. A new committee of finances coming in to take the place of the old, of course had to try to arrange matters in such a way that these amounts against the society should not be so large, and the result is that these debts are, in a manner, wiped out. I do not think any county agricultural society will be benefited very much by lowering the rates admission. I think it would be much better to raise the rates. I think, if I had my own way, I would raise the rates of admission to fifty cents, and charge children accordingly.

Mr. F. S. HOLCOMB, of Huntingdon, New Jersey. Huntingdon county has a different system of tickets from any county heard from this morning. When our society was organized several years ago, as an inducement they gave each stockholder five tickets, which he was entitled to draw each day of the fair. That was very obnoxious. We undertook to reduce it down to three, but the stockholders found so much benefit from it that they voted to continue it as it was. In former years we made money, until we had three thousand three hundred dollars out at interest. Providence sent a tornado, and it was necessary for us to expend a great deal. Since then people have found out the way to get in without paying until we are in debt. Some of the directors have advocated placing the price of admission at more than twenty-five cents. So far it has been at twenty-five. We give an exhibitor a ticket every day, even if the person brings but a loaf of bread. We do not find that very injurious; but the great difficulty is in the stockholders cheating themselves, for some of them, as well as some exhibitors, after getting inside, take their ticket and poke it through the fence. We used checks from half past twelve to two o'clock. Soon after this was started, a gentleman outside bought the checks for ten cents, turned around and sold them for fifteen cents, thus making five cents on each check. You will readily see that the society lost twenty-five cents in each instance. If that check would bring the same person back there would be no loss; but bringing another person, who, without the check, would have paid twenty-five cents, the society were the losers in every instance. With these evils existing our receipts have not been up, during the past two or three years, to what they formerly were. We have lost a great deal of money. The other day I made a motion to dispense with the check system. It carried. But there is a wonderful war going on already. They say that the tavern-keepers will raise a rebellion. They declare that by the abolishment of the check system much of their revenue is cut off. Now the tavern-keepers have a great deal of influence, and will show it when we come to elect directors next year.

Mr. E. **REEDER**, of Bucks. When the Darlington (New Jersey) county fair raised the price to fifty cents we prospered.

Mr. **HOLCOMB**. I took notes of the results. Some four or five years ago that society was some eight thousand dollars in debt. The society was run by the stockholders. They then placed it in the hands of directors. The first year they raised the premiums a little. They raised the price to fifty cents after the first day. The next year they did better, and they have kept on until now they have eight thousand dollars on interest. They charge twenty-five cents the first day because there is not much there. They draw a good many people from Trenton, Philadelphia, and towns adjacent in their county. Of course, people living in cities pay more than farmers without hesitation. That is why they benefit their finances and prospered so much more than we have prospered in the county of Huntingdon. We are rather a poor set of people up there, and twenty-five cents is more than our people can well pay. At Darlington they come in from Philadelphia, Camden, and Bordentown, and have a large scope of country to build up from, which we haven't got. They can charge fifty cents there and stand it; but it would not do for us to fix that rate if we would be benefited.

J. S. **KELLER**, of Schuylkill. In Schuylkill county we have had different plans. We have used family tickets, admitting a man and the members of his family under twenty-one years, and we have had the same experience that they have had at Lehigh. They would bring a carriage full of people, say from Schuylkill Haven, and bring a ticket with the name written on it. The next day the same carriage would come with a different party in, and thus it would go every day. We found it necessary to make some change. We have now come down to giving dollar tickets only to those exhibiting, and let the member and his family enter on that ticket. We gave at the last exhibition no family tickets, except to exhibitors. We charge twenty-five cents for a single ticket, and sell five tickets for a dollar. That is the only way we find to prevent imposition. Because we give a dollar ticket to an exhibitor a good many growl, and say these people are favored.



COMPARATIVE FUEL VALUE (DRY) OF 21 KINDS OF WOOD SOMETIMES USED AS FUEL IN PENNSYLVANIA.

10th Census.

Those who growl say, "These get a dollar ticket just because they bring a loaf of bread or half peck of apples to the exhibition." I believe if all the societies would pursue the course of the State society they would not be imposed upon. So far as I am concerned I will insist upon our society adopting that plan and keeping it up.

D. H. FORESMAN, of Lycoming. We have an executive committee of ten, a president, vice president, secretary, and treasurer. These are all the dead-heads we have in our agricultural society, with the exception of the chairman of the home department, who is a lady, and she has a few persons who assist her. These persons have a badge "Executive Committee," and they are required to have it on all the time. Every other person pays twenty-five cents, with the exception of ministers of the gospel and members of the press. Children are charged half price. We take a card and number it, and put five figures upon it, and charge the purchaser one dollar. He goes to the ticket office and buys his card; goes to the gate keeper, who has a punch, such as a conductor has, and every person who passes that gate has a number on his ticket punched out. When his ticket is out he gets another for one dollar, entitling to five admissions, or a ticket entitling to twelve admissions for two dollars. A man goes and buys a dollar ticket, does not use it up the first day, and he says: "Well, I might as well use it up," and so he does on subsequent days. We have practiced this successfully. I thought certainly some one here to-day would mention this plan in addition to the others that have been named, as I am sure there can be no better. We do not care who the five are who go in. We get a dollar for five admissions, and we sell more tickets thereby than where we charged twenty-five cents for each admission. Now, a question may arise like this, that they might make twenty-five cents for the society; but the society will gain in the end by selling these dollar tickets, for the reason that the person will buy five admissions for the dollar. We leave it to the judgment of the gate keeper, or to one of the executive committee, at the gate. If a man comes with a family of two children and four grown persons, they go in for the one dollar. They admit two children for each number punched. We do not charge for a horse and carriage. We allow them to exhibit free.

ADVANTAGES OF DEEP AND SHALLOW PLOWING.

By ISRAEL GARRETTSON, *Member from Adams.*

Read at Spring Meeting.

I am fully aware of the fact that about all can be said upon the "advantages and disadvantages of deep plowing" has already been said by those for more able to speak upon it than I. All that I expect to do is to give my experimental knowledge on the subject. Some one has said that "he who caused a man to think is deserving of a monument." If, in this paper, I can start a thought I shall be encouraged in my undertaking. I am of a candid opinion there is no question before the farmers of to-day, touching the matter of growing crops, that is of more vital importance than this. Let us but take a glance over our hills and valleys, and this will at once teach us there is a gradual wearing down of the hills into the valleys.

Admitting this fact we must adopt the plan of deep plowing pretty generally. Shallow plowing is the best in a virgin soil, the plow to go deeper and deeper each time the ground is gone over until a good depth is reached.

This way of plowing commends itself in two ways. It acts to the maintaining of moisture in dry weather, and when the season is wet the ground absorbs the water. The successful farmer must thoroughly understand the nature and quality of soil he has to cultivate. If it should prove to be of a sand loam underlaid with sand and gravel, it is then shallow plowing takes its place. Under these circumstances the nearer the surface we can keep vegetable matter the greater will be our yield of crops.

"It must be kept in mind that the term soil has two meanings, for there are two layers of it on the rock—an upper and an under soil and a sub-soil. The latter is the geological soil, the former is the agricultural soil. As the sub-soil is made of rocks, beneath it by decomposition, so the soil, in its turn, is made of the sub-soil beneath it by composition. The first change is purely chemical and mechanical, and would take place if there were neither vegetable nor animal life on the earth. The second change takes place through the agency of plants and animals."

The sub-soil which has never been stirred to admit the atmosphere freely, contains the low-oxide, and when first turned up, if sown or planted soon, the roots of the crops take in this poisonous soluable compound of iron, and are much injured if not killed outright.

Turn up a little of such sub-soils at a time, an inch or so each year; let it be exposed to air and frosts for a few months, and it will become innocuous. The new elements of plant food in this new soil will ever act as a useful fertilizer.

It is much to be regretted that deep and thorough plowing is much neglected, owing to many of our farms being worked by tenants who are not interested in the deepening of our soil, only how much they can extract therefrom, to the disadvantage of the owner.

The farmer who turns his own soil will no doubt realize that he is not only the owner of the top soil but all that is bedded underneath. He will sink his plow inch by inch until he will realize he has turned up another farm underneath the one he commenced working.

This fact will be proven by double the number of bushels of grain raised, double the number of blades of grass grown.

Wherever this practice of deep plowing on heavy soils is practiced, our deep-rooted wheat and corn and other crops laugh at the drouth. Their roots are all the while drawing up water and moisture faster than the scorching sun can steal it away.

Lands of this character, when not deeply cultivated, we find them seriously effected by the extreme seasons, wet and dry. If it should be wet, the crops drown; if dry, they will soon burn out with the scorching sun.

Thus I have endeavored to show the advantages and disadvantages of of deep and shallow plowing, which makes me more and more fixed in the practice of deep and thorough plowing.

The subject being open for discussion,

Mr. **EVES**, of Columbia county. How far down would the gentleman go to have what he calls deep plowing?

Mr. **GARRETTSON**. From eight to ten inches in depth. We can reach deeper by sub-soiling. We plow four horses to a plow, and from eight to twelve inches we consider a good depth. I have know farmers to boast of deep plowing, from fourteen to sixteen inches. When you come to average, if you go down six to eight inches, you are about at their usual depth. As I said, from eight to twelve inches is good, but we can go deeper by sub-soiling, which we have done.

Mr. **BARNES**, of Lehigh. In case the soil is weak and shallow, how deep should the first plowing be, before you add inch by inch?

Mr. **GARRETTSON.** I would not advise plowing more than four or five inches, if the soil is thin. Turn the furrow from four to five inches at first, still deepening as the soil is improved. The objection I have to sinking at once as deep as we desire is, first, we may not have force enough; secondly, if we turn up so much sub-soil, we have difficulty in producing crops. By raising a little at a time, we can produce moderate crops.

I did not get all in my paper that I would like. I have seen lands worked by tenants, who seemed to work it thin, and also seemed to want to get along with as light work as possible. I think if the land-owner could devise some plan to offer some inducement whereby the worker of the land would work to such a depth, as well as to give a certain product from the farm, it would prove an advantage to the tenant and landlord eventually.

Mr. **KELLER.** You recommend the plan of fertilizers being freely put on from time to time?

Mr. **GARRETTSON.** Yes, sir. That belongs to improving the land.

Mr. **KELLER.** If you do little else than plow, you may plow your land thoroughly without good results.

Mr. **GARRETTSON.** That is very correct. We get a good horse and put him in the stable, and we may curry him as well as we can; if we do not feed him the horse will starve. If we want to get something out of our land, we must work it and feed it. The stronger we work it, the more we should feed it; or, as we work our land, we should feed it in the same ratio.

Mr. **EVES.** This matter of deep plowing is something that I tested pretty thoroughly in my earlier years. I think I spent a good deal of money for deep plowing that I got no return for, especially for corn. Four inches would be very shallow, and six inches moderately shallow. To plow down ten inches for corn is lost work, not only on account of the cost of plowing and in the preparation, but because of the depreciation of the crops. I prefer shallow plowing for corn. I do not know that it is called for in any other crop. This is the result of my experience. When I was doing the deep plowing for corn, my neighbors were outstripping me by shallow plowing. They taught me, by this experience, that while deep plowing might do for other crops, shallow plowing was best for corn, and I had to give it up.

Mr. **MUSSELMAN.** I plowed very deep when I commenced farming; but I am now of the impression that you have got to adapt your plowing to your soil. If you have deep soil you can plow deep; but with shallow soil you must have shallow plowing, of course going down gradually as the essayist says. There is not so much in the old rhyme; it depends entirely upon the nature of the soil that you have about this deep plowing.

Mr. **GARRETTSON.** I did not understand from the nature of the question asked me, or the remark of Mr. Eves, that it was upon the advantages and disadvantages of deep and shallow plowing. It was not stated what kind of crops should be placed on the deep-plowed land or what kind on the shallow. I did not say that it was for crops equally alike; I did not defend that doctrine; but I defended the doctrine if you have deep soil you will have to plow deep; but with a light soil, and the sub-soil open and gravelly, you will have to work shallow. When we come to producing the crops, I think that comes in under another head. I did not say anything about plowing for corn, whether deep or shallow, or wheat or any other crop.

Mr. **EVES.** The plowing should not be governed by the soil or the planting altogether either. If you want to have a large amount of manure expended on that land plow deep; but if you have only a limited amount do not run out of the soil. I repeat, if you have an abundance of manure plow deep; that that is one thing to be borne in mind as to the depth.

LESSONS OF 1881 AND THE OUTLOOK FOR 1882.

By E. REEDER, *Member from Bucks.*

Read at Annual Meeting.

At the time of the summer meeting of our board, held in the city of Williamsport, the first week in June, 1881, a general and protracted rain storm prevailed all over the eastern section of our State. For a period of four days and four nights the rain descended in showers quickly succeeding showers. Small streams overflowed their banks, bridges were swept away, and fording made dangerous and impossible. The volume of water in the rivers was so increased that towns and cities upon their banks were threatened with inundation; logs were escaping from the boom and running away by the hundreds and thousands. Members of this board were anxious to return to their homes to see how things were faring there, and in some instances were compelled to resort to the mountain roads in order to reach their homes in safety. The amount of water-fall during this storm ranged from four to six inches, according to locality; more than has fallen during the four months next succeeding.

It has often been remarked that nature does things, or works, by extremes; at least this is the view taken of her operations by finite beings. Men seem to be, by nature, complaining and fault-finding. When it rains, we are either not ready for it, or think we are having "entirely too much," or "not half enough," as the case may be. When it is dry and hot, with all the accompaniments, murmurs of dissatisfaction soon rise to loud wailings of lamentation all over the land.

The drouth of 1881 exceeded in duration any former one since the first settlement of our State, two hundred years ago. I count it from June 10 to October 20, a period of one hundred and thirty-three days. From July 1 to October 1, a period of ninety-two days, the amount of rain-fall, as recorded at two different stations in Bucks county, is as follows:

	At Centre Bridge.		At Quakertown.
July,	31 days,	.625 inches,	.73 inches.
August,	31 days,	.375 inches,	.27 inches.
September,	30 days,	.500 inches,	.89 inches.
Total,	92 days,	1.5 inches,	1.89 inches.

An old record, showing the length of the various dry periods which have previously visited our State since its settlement, in 1682, I find to be as follows:

In 1694, 92 days; 1705, 40 days; 1715, 46 days; 1718, 61 days; 1730, 92 days; 1741, 72 days; 1749, 108 days; 1772, 80 days; 1791, 82 days; 1812, 28 days; 1856, 26 days; 1871, 42 days; 1876, 26 days; 1881, 133 days.

The dry spell of 1881 may safely be counted from the middle of June until the middle of October, a period of four months, or one hundred and twenty-two days, and exceeding the famous dry spell of 1749 by at least fourteen days, and I think by twenty-five days, or nearly a month. The records already quoted show the amount of rain-fall to be:

	At Centre Bridge.	At Quakertown.
June,	4.5 inches,	4.1 inches.
October,	2.12 inches,	1.57 inches.

It must be remembered, however, that the fall of rain in June occurred *before* the 10th of the month, while that of October fell *after* the 20th of the month. This makes the duration of the dry period one hundred and thirty-three days, as before stated. If we compare the dry periods of the present century, or the last hundred years, with the hundred years preceding it, we shall find that they have been less frequent and generally less severe.

Effects of the Drouth of 1881.—An editorial in one of our prominent agricultural journals, last summer, assured its readers that the benefits resulting from the drouth would greatly overbalance the evils from which we were then suffering; would, in the end, redound to our advantage. This, at a time when our pastures were brown and bare, when our corn was withering crisp under the scorching rays of the sun, when our springs and wells were failing and gone, was a point not so easy to see—a proposition that did not seem capable of demonstration. In times of heavy rain-falls, as the swollen mountain streams bring down those rich mineral elements and deposit them upon our alluvial or delta soils, which our State Geologist told in a lecture, delivered here a few winters ago, were the richest soils in the world, so too, in times of extreme drouth, as the roots of plants descend deeper into the soil, bringing up for their own, and for future use, those vegetable and mineral elements of plant-food which had become buried beyond the reach of plant roots in ordinary seasons. As extreme freezing of the ground during winter loosens and mellows the soil for the benefit of the crops the succeeding summer, so, too, in time of extreme drouth, by the deeper penetration of plant roots, by the more perfect aeration of the soil, by the capillary action of water rising through the soil, are all aids in producing the same results. The more immediate effects of the late drouth were, almost absolute ruin of the corn crop; a cutting off of fall pasture; the destruction of the young grass in the stubble fields; the drying up of our springs, wells, and small streams; the death of many valued forest, fruit, and shade trees. Our crops of hay, wheat, rye, oats, and early potatoes were even better than those of the preceding year, 1880. What lessons are we to learn from this, and what provisions can we make for the future?

Economy.—The first great lesson which we should have learned in 1881 is the necessity of economy. Economy in feeding; how to get the best results from the feed given, is a problem we are all now necessitated to study. Our barns and bins are not so full as they were at this time last year. With us winter feeding practically commenced with the first month of autumn; and although the present winter may be open and short, nevertheless the spring pastures will be delayed beyond the usual season. This condition of things will arise from two causes: 1st. Because, in many cases, the grass to make the pasture next spring is not alive, and we shall have to await the germination and growth of seeds to be sown as soon as spring opens. 2d. Because, in many cases, it will be found necessary to save and cut for hay a greater acreage of land, in order to fill our barns once more. By confining our cattle to the stalls and yards a month longer in the spring; by turning to pasture the middle of June instead of the middle of May, our crop of hay can be increased at least thirty-three per cent. So far this winter I have tried the experiment of feeding cattle but twice a day, and it has worked well. The noon feeding has been dispensed with, and the fodder heretofore wasted and trampled in the yard, will now be cut and fed in the stalls. This plan alone will enable me to keep one third more stock, or to carry the same stock through a feeding season of nine months, which by former practice would only last six months. I reasoned thus: If during long nights and short days a cow can go from evening until morning without feeding, why may she not eqally well go from morning until evening in the same manner? But while this practiee may do for our cows, it may not work eqally well for all our domestic animals. In feeding economically, the habits and capacities of the different classes of animals require to be respectively studied. The cow has a large, roomy stomach, capable of holding a large feed, which it requires ten or twelve hours to digest and assimilate. The horse and the hog have small stomachs comparatively, and they should be fed little at a time and often. The same amount of food fed three times a day, at intervals of six hours, will be better for them than two feeds a day.

LABOR.—The second great lesson which we should have learned in 1881 is the importance of labor. Without work we shall not be able to realize much. It has long ago been settled as a proverb, that "God helps those who help themselves." The command was early given, "By the sweat of thy brow shalt thou earn thy bread." Labor is necessary for the preservation of health, for the acquisition of knowledge, and for the attainment of all those things necessary to enable us to live prosperous and happy lives.

TRUST.—The third great lesson which we should have learned in 1881 is duty of trusting the future; confidence in the All-creating, All-sustaining power. A great many people were more or less troubled during the continuance of the drouth by the sentiment expressed in a couple of lines of rhyme, which were widely published the latter part of 1880:

"In eighteen hundred and eighty-one
The world to an end will come."

It is no matter to us whether this planet upon which we dwell is gradually passing from a solid to a gaseous state, as the disintegration of rock moldering into soil by the action of frost, wind, and rain would seem to indicate; or, on the other hand, whether it is changing from a gaseous to a solid state, as some philosophers affirm, and as some facts in nature seem to point. In either case it is evident that long before either event could be accomplished, it would become unfitted for the abode of human beings, and the race of man will have disappeared from the face of the earth. This question, like the existence of a hereafter, need not trouble us, for if there be one we shall all know it and enjoy it according to our deserts; and if there be not one, as Cato and Hamlet soliloquized, not a soul of us will ever know it. This thought should afford some consolation. Our vocation, as tillers of the soil, is to a certain extent uncertain. We must trust in the future. After the soil has been prepared, after the seed has been cast into the ground, a little cultivation is all that we can do for it. But He who "tempers the wind to the shorn lamb," who "sendeth the early and the later rain alike upon the just and the unjust," who "doeth all things well," will, in due season, enable us to gather in the harvest.

OUTLOOK FOR 1882.—And now, having learned these lessons of frugality and of faith, let us enter upon the new year of 1882 with higher resolves; with a stronger determination to repair and make good our former losses. Our prospects are not as bright as they might be, but we should not look too much upon the dark side of things. There is no cause for despair, and there is plenty for us to do. A little timely and extra exertion upon our parts will cause the now desert places in our land to again "bud and blossom as the rose." Our fields will soon be clothed with verdure; will again wave with their crops of golden grain; and our granaries overflowing with yellow corn. Then shall we be able to say with one of our greatest poets:

"Let us then be up and doing,
With a heart for any fate,
Still achieving, still pursuing,
Learn to labor and to wait."

PENNSYLVANIA CROPS, 1882.

Wheat.

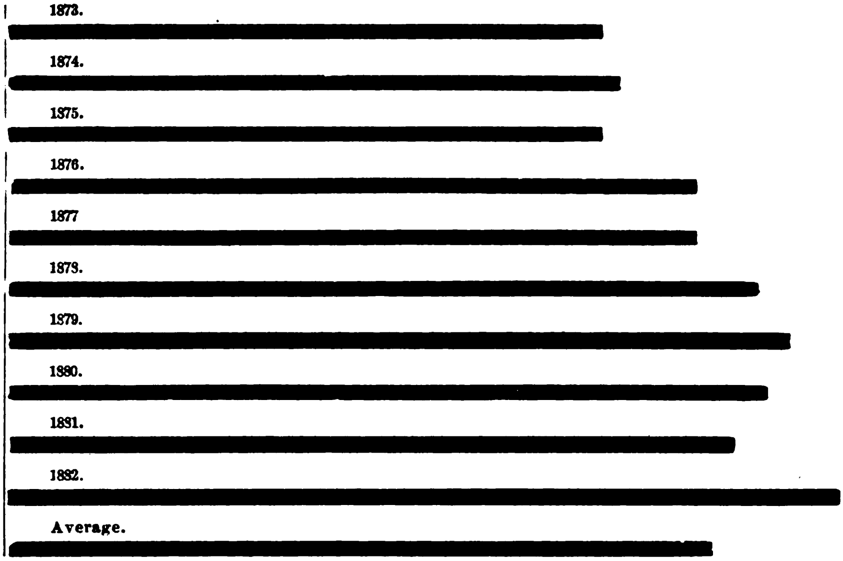
At no period since the organization of our corps of official reporters, in 1877, have we been called upon to place on record so great a variation between the spring and summer condition of the wheat crop. The consolidated results of the May reports (see Sixteenth and Seventeenth Quarterly Reports, page 17,) indicated that in Adams, Allegheny, Bradford, Bucks, Cambria, Cameron, Columbia, Crawford, Dauphin, Erie, Indiana, Jefferson, Juniata, McKean, Mercer, Northumberland, Potter, Schuylkill, Somerset, Sullivan, Susquehanna, Tioga, Union, Venango, Washington, Wayne, Westmoreland, and Wyoming, the condition of the crop was then below the condition of the crop of 1881, at the same date, from five to fifteen per cent. In Carbon, Clinton, Cumberland, Fayette, Lackawanna, Lycoming, Monroe, and Snyder, it was reported as the same as that of the crop of 1881. In Beaver, Bedford, Berks, Blair, Butler, Centre, Chester, Clinton, Clarion, Clearfield, Delaware, Elk, Forest, Franklin, Fulton, Greene, Huntingdon, Lancaster, Lawrence, Lebanon, Lehigh, Luzerne, Mifflin, Montgomery, Montour, Northampton, Perry, Philadelphia, Pike, Warren, and York, the indications were from one to fifteen per cent. better than in 1881. When our May reports were made out, it was evident that our only chance for a good wheat crop for 1882 (unless a change should take place) lay in the fact that among the counties indicating the greatest per cent. of increase over 1881, were to be found those yielding the largest amounts of wheat—notably Lancaster, York, Lehigh, Chester, Lebanon, and Montgomery.

Our "Reporters' Notes," for May, (see Sixteenth and Seventeenth Quarterly Reports, page 7,) would seem to indicate that the low condition of the crop was due to the following causes: The autumn of 1881 was very dry at seeding time, and, as a consequence, much of the land sown with wheat was not in its usual good condition; much of the seed was but imperfectly covered; some of it had sufficient moisture to sprout it, but not enough to carry on its growth; some was lost by winter-killing and freezing out, especially on low land and heavy clay soils; some fields were injured by the absence of snow during the prevalence of high winds; the cold, backward spring had also its part to play in the decrease; and several correspondents report damage resulting from deep seeding, which was caused by the dry condition of the soil in September and October, 1881,

Our "Reporters' Notes," for October, (see Eighteenth Quarterly Report, page 42,) indicate that the unusually favorable weather which followed the late spring of 1882, not only repaired the damage and loss from the above causes, but also carried the average condition of the crop beyond that of the preceding year, until the returns from fifty-nine counties indicated an increase over the crop of 1881, varying from two per cent. in Schuylkill, to forty per cent. in Lancaster, while in Columbia, Dauphin, Lawrence, Luzerne, Snyder, Somerset, and Union, the yield was from one to ten per cent. below that of the crop of 1881.

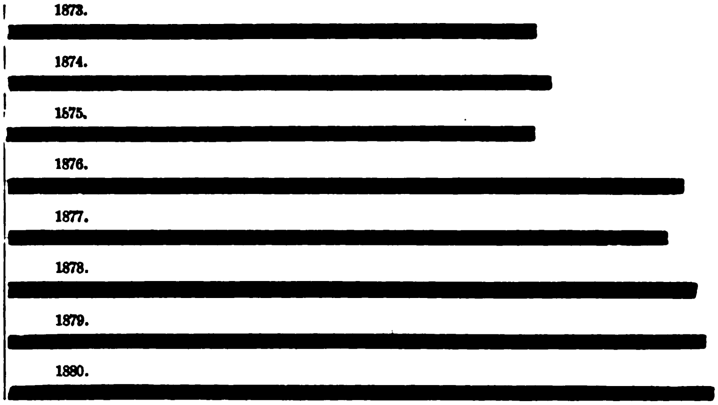
The carefully compiled returns of our official reporters warrants us in estimating the crop of 1882 at 22,425,000 bushels, from 1,495,000 acres, or at the rate of fifteen bushels per acre, and one of the largest total crops for the past ten years, and only exceeded in yield per acre, during the past eighteen years, by the crops of 1879 and 1871. (See plate I.)

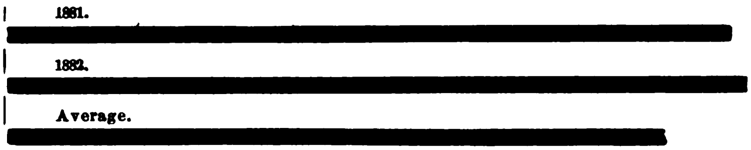
A comparison of the total yield of the crops of the past ten years, when shown upon a scale of 5,000,000 bushels per inch, gives the following:



During the past ten years the acreage of wheat has increased from its lowest point, (1,101,000 acres,) in 1875, to its present extent, (1,495,000 acres,) in 1882. From 1873 to 1876 this increase was gradual; in 1876 a rapid increase in acreage is shown, but after that date, until 1880, the increase was about in its previous ratio; in 1879 the general failure of the grass seed in the stubbles of that year caused many to re-seed their fields, thus materially increasing the acreage. The same cause operated to increase the acreage of 1881 and 1882, until with the present good set of grass in the wheat stubbles of 1882, we may look for a slight decrease in the acreage for a few succeeding years.

When the acreage for the past ten years is compared with that of 1882, and with the average upon a scale of 4,000,000 acres per inch, we have the following:





When the acreage of the crop of 1882 is compared with that of 1881, (see Sixteenth and Seventeenth Quarterly Reports, page 19,) Adams, Blair, Bucks, Cambria, Cameron, Centre, Chester, Clearfield, Crawford, Delaware, Elk, Fayette, Forest, Franklin, Greene, Lancaster, Lawrence, McKean, Mercer, Mifflin, Montgomery, Perry, Schuylkill, Sullivan, Susquehanna, Venango, Wyoming, and York, show an increase of from five to thirteen per cent., mainly caused, as before stated, by the re-seeding of the stubbles of 1881. Beaver, Berks, Butler, Clinton, Cumberland, Erie, Huntingdon, Juniata, Lackawanna, Lebanon, Lehigh, Monroe, Philadelphia, Snyder, and Westmoreland report the acreage of 1882 as the same as in 1881, while the remaining counties report a decrease in acreage varying from two per cent. in Centre to nine in Washington, caused, as the reporters explain, mainly by dry weather, which prevented the preparation of the ground.

As indicated by Plate I, the price of wheat, January 1, 1882, was at the highest point for the past eight years, and since 1869 was only exceeded in January, 1872, when the price had risen to $1 70 per bushel. A comparison of Plates I and V would indicate that there was little or no connection between the price per bushel and the yield per acre, and proves that the crop of Pennsylvania has but little effect upon the market. The only point at which the reader will detect any sympathy between price and yield per acre is in 1866 and 1867, when the low yield of eleven bushels per acre was sold at a fair price next year. As indicated by Plate XII, the price per bushel has been generally downward, with an upward spurt in February, April, and July, closing the year with a slight rise in October.

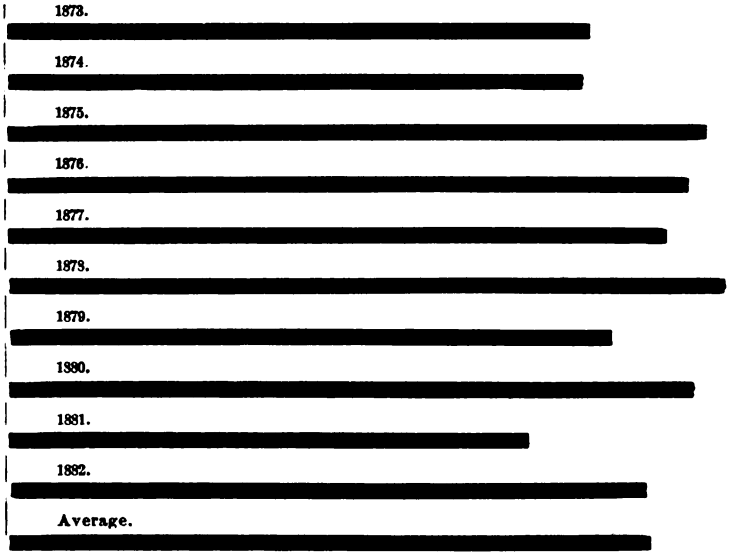
A careful perusal of our "Reporters' Notes" will suggest the following points: The importance of a combination of labor and manure, decreasing the acreage, but expending the same in greater amount of labor and manure; more careful attention to depth of seeding and condition of the soil at time of seeding; greater care in the selection of seed; in many cases later seeding to avoid the ravages of the fly; increased use of the drill in preference to broad-cast seeding; more even distribution of barn-yard manure; deeper plowing and more thorough harrowing; and the use of not more than a bushel and a half of seed per acre.

Our consolidated reports of the condition of the growing crops (see Eighteenth Quarterly Report, page 43,) show that in Beaver, Cameron, Dauphin, Forest, Huntingdon, Luzerne, Monroe, and Potter, the condition is below that of the same time last year, varying from two per cent. in Cameron to six per cent. in Luzerne; and that Bucks, Chester, Cambria, Crawford, Delaware, Elk, Greene, Lehigh, McKean, and Wyoming report it as the same as in November, 1881, while the remaining counties report it as in better condition, varying from two per cent. in Erie, to fifteen in Columbia, Lancaster, and Union. In acreage Bedford, Huntingdon, and Luzerne report the growing crop below that of 1881, while the remaining sixty-four counties report it the same, an increase varying from two per cent. in Allegheny, Cameron, Chester, Erie, Greene, Mercer, Montgomery, Potter, Snyder, Somerset, Sullivan, and York, to ten per cent. in Northampton and Wayne.

Corn.

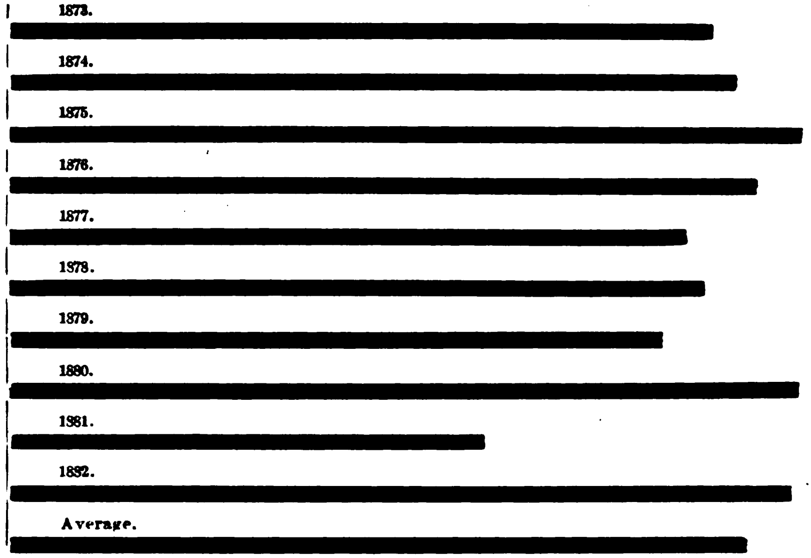
Owing to a cold and backward spring, which very much retarded planting, followed by wet and cool weather, which caused much of the seed to decay in the ground, our spring reports of this crop were very unfavorable. An unusually favorable autumn has enabled the crop to recover much of its lost ground, until at husking time our reporters estimate the crop at considerable above that of the preceding year. Fifty-eight counties report an increase over the crop of 1881, varying from five per cent., in Philadelphia, to seventy per cent. in Lawrence, while Adams, Cameron, Erie, Lackawanna, Luzerne, McKean, Monroe, Pike, Potter, Somerset, Susquehanna, Warren, and Wyoming report the crop of 1882 as less than that of 1881, varying from twenty-five per cent., in Luzerne, to three per cent., in Pike; Blair, Dauphin, Greene, and Sullivan report the yield in 1882 as the same as in 1881.

The consolidated crop reports of the correspondents lead us to estimate the crop of 1882 at 39,875,000 bushels per 1,375,000 acres, or at the rate of twenty-nine bushels per acre. When the crop of 1882 is compared with each crop of the preceding nine years, and with the average, upon a scale of 12,000,000 bushels per inch, we have the following exhibit:



From this it will be seen that the crop of 1882 does not vary much from the average of the past ten years, while Plate V, shows that, with the exception of that of 1864 and 1881, the yield per acre is the largest for the past eighteen years, during which time the price has varied from one dollar and fifty cents, in 1864, to fifty cents, in 1878. As with the wheat crop, a comparison of Plates I and V fails to show any general connection between yield per acre and price per bushel.

When by a combination of the total yield in bushels and the *average* price per bushel we obtain the total value of the crop, and upon a scale of 6,000,000 dollars per inch compare it with the total value of the crops of the preceding nine years, and with the average crop of the past ten years, we obtain the following result:



Indiana, Philadelphia, and Warren counties, reported slight decrease in the acreage of the crop of 1882, when compared with that of 1881, and Fulton, Greene, Indiana, Philadelphia, and Warren, reported slight decrease when it is compared with the average crop of the preceding five years. Adams, Allegheny, Blair, Carbon, Columbia, Dauphin, Erie, Fulton, Lackawanna, Lawrence, Luzerne, Mercer, Potter, Tioga, and Wayne, report no change in acreage since last year, while all the remaining counties report an increase in acreage, varying from two per cent. in Beaver, Berks, Chester, Clearfield, Crawford, Lebanon, Northampton, and Susquehanna, to fifteen in Bucks. This increase is mainly due to the failure of the grass crop, which, in many instances, led to the planting of larger areas of corn. The increase in acreage, as compared with the average of the past four years, is greatest in Fayette, where it is reported at twelve per cent.

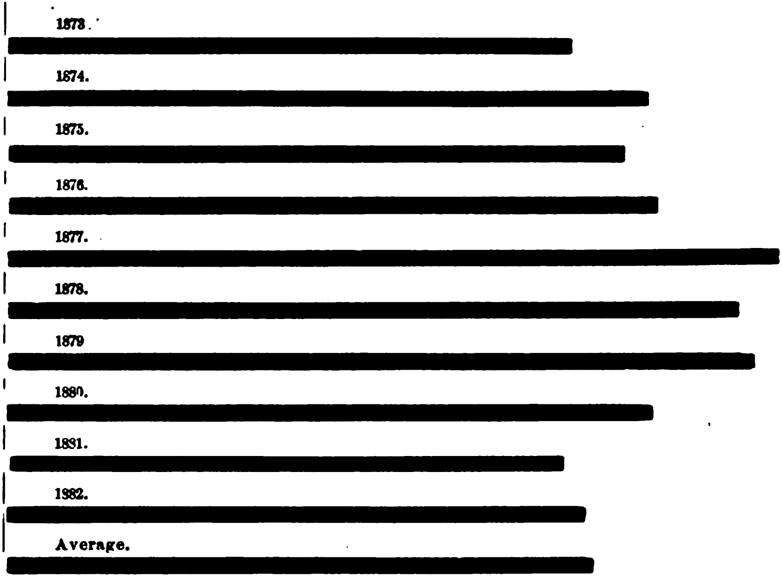
The "Reporters' Notes" would seem to impress upon the growers of this crop, the following important needs: A greater care in the selection and preservation of the seed, as a number of instances are reported of damage done to seed by severe freezing weather, before the grain was sufficiently dry; the importance of paying more attention to the condition of the soil, and less to the time of year when planting the crop. A number sustained much loss from planting (late, when compared with other seasons,) before the soil was warm enough to sprout the seed. Had the seed planted all sprouted properly it would have added four or five bushels per acre to the average crop of the State. Several reporters state that the past season has clearly shown the value of some stimulating application with seed in the hill, to keep it in vigorous growth early in the season, and one or two note the injurious effect of a direct application of manure from the poultry-house, when in contact with the seed. To sum up, we may state that if the whole 1,375,000 acres planted in this State had been, at the proper time, planted with carefully selected, properly cared for seed, it would, in all probability, have added 4,750,000 bushels to the total yield, and a corresponding amount to the total value of the crop.

Oats.

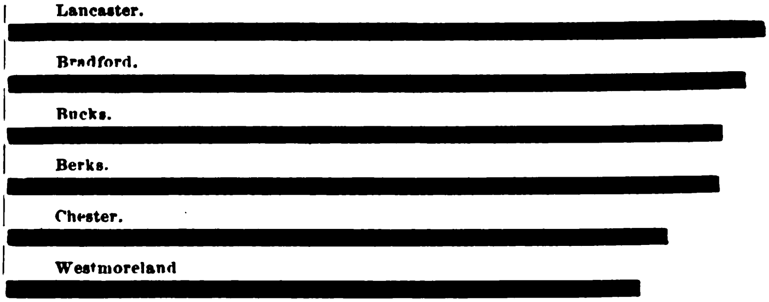
Of the total yield of this crop Armstrong, Blair, Cambria, Lawrence, Lycoming, Tioga, Warren, Westmoreland, and Wyoming report an increase over the crop of 1881 of from ten per cent. in Blair, Lawrence, and Tioga, to one per cent. in Wyoming, while Center, Columbia, Huntingdon, Montour, and Sullivan report the same yield as last year. The remaining fifty-eight counties show a falling off, as compared with the crop of 1881, of from twenty-four per cent. in Bedford, Berks, Carbon, and Schuylkill, to three per cent. in Bradford, Clarion, Crawford, and Mifflin. When the crop of 1882 is compared with the average of the past five years, fully eight counties show a falling off, varying from two per cent. in Lackawanna, Mercer, Mifflin, and Montgomery, to twenty-five per cent. in Bedford and Carbon.

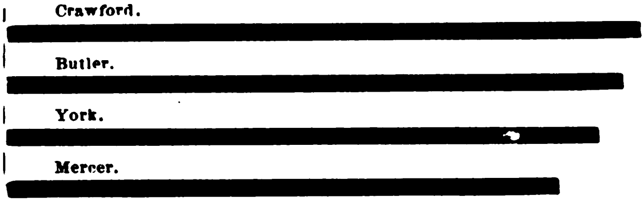
The returns warrant us in estimating the crop of 1882 at 34,580,000 bushels from 1,235,000 acres, or at the rate of twenty-eight bushels per acre.

When the crop of 1882 is compared with those of the preceding nine years, and with the average of the past ten years, on a scale of 12,000,000 bushels per inch, we have the following result:



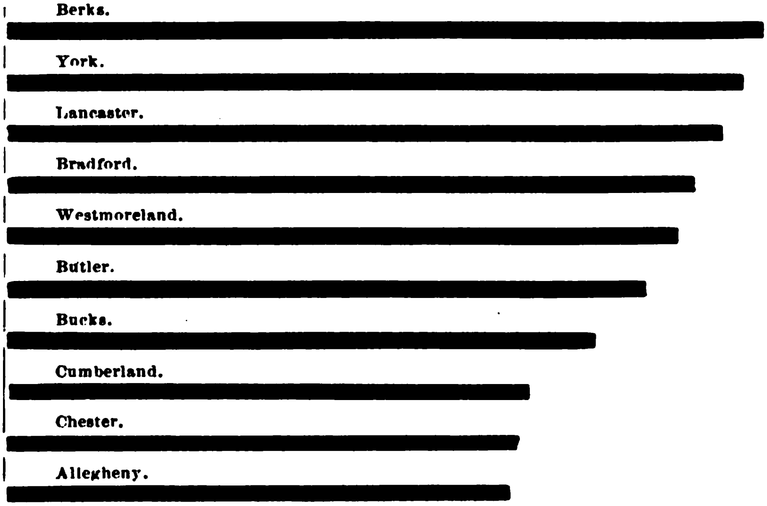
The comparative yield of oats in the ten counties producing the largest amount, when shown on a scale of 350,000 bushels per inch, is as follows:





In reporting the acreage of this crop Chester, Clarion, Delaware, Greene, Indiana, Lawrence, Montgomery, Tioga, Union, and Westmoreland show a slight falling off, caused, as our reporters explain, by the increased acreage of potatoes, and the increased area of green crops for summer-soiling stock. Blair, Cambria, Carbon, Crawford, Dauphin, Fayette, Juniata, Lancaster, Lebanon, Lycoming, Monroe, Montour, Philadelphia, Pike, Potter, Snyder, Venango, and Wayne report the acreage as unchanged, while the remaining counties report a slightly increased acreage, varying from two per cent., in Chester, Clearfield, Fulton, Jefferson, Lehigh, Northumberland, Schuylkill, Somerset, Wyoming, and York, to eight per cent., in Bradford. The increase in the acreage of tobacco, potatoes, Hungarian grass, and soiling crops prevents the increased acreage of corn from being shown in this crop.

The ten counties seeding the largest area of this crop, and shown in a scale of 12,000 acres per inch, are as follows:



The yield per acre of this crop (as shown by Plate VI) proves it to be one of the most irregular on our list, varying from nearly forty bushels per acre, in 1868 and 1877, to 28 bushels, in 1868, 1874, and 1882.

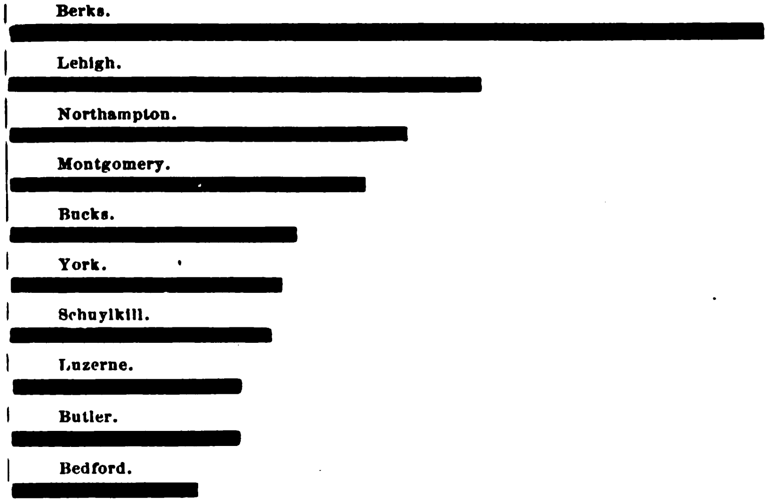
The price per bushel for the past eighteen years (as shown by Plate II) indicates a variation from eighty-five cents per bushel, in 1864, to thirty cents per bushel in 1878; in this variation it would seem that its price was in sympathy with that of corn, for there is a close resemblence in Plates I and II between these two crops. Since December, 1881, the price (still in sympathy with that of corn) has gradually increased from forty-nine cents, at the above date, to sixty-two cents in November.

Rye.

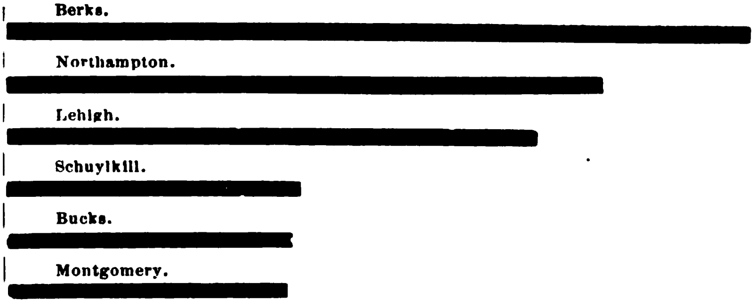
The facts already recorded in relation to a comparison between the condition of the wheat crop in May, and with its actual yield at harvest, will apply with equal force to this crop. Our May reports indicated that in thirty counties it was from three to eighteen per cent. below the crop of the preceding year; that in twelve counties it was in as good condition as at the same date in 1881; and that in the remainder it was better than the crop of the past year. In our after-harvest reports but two counties report this crop below that of 1881; sixteen report no change; and the remainder report an increase varying from twenty per cent. in Adams to two per cent. in Clinton, Huntingdon, Sullivan, and York.

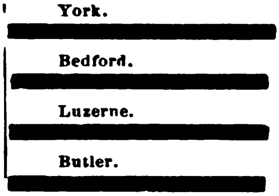
Our reports indicate that the crop of 1882 may be estimated at 5,805,000 bushels, grown on 387,000 acres, at the rate of fifteen bushels per acre.

The ten counties producing the largest number of bushels of rye on a scale of 100,000 bushels per inch are as follows:



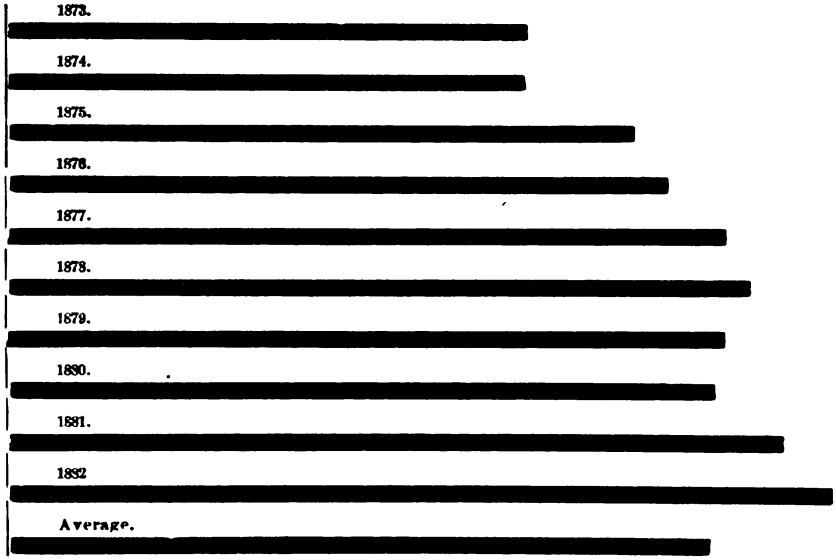
Three of these counties report a decrease in the acreage of this crop, varying from two per cent. in Adams, Chester, Fulton, Montgomery, Perry, and York, to ten per cent. in Clarion, Luzerne, Schuylkill, and Washington. When compared with the average acreage of the past five years, Adams, Dauphin, Jefferson, Luzerne, Monroe, Montgomery, Northumberland, Potter, Schuylkill, Snyder, Somerset, Susquehanna, and Washington show a small falling off, while the acreage in the remaining counties either remains stationary, or show a very small increase, in no case greater than four per cent. The ten counties having the greatest acreage shown on a scale of 10,000 acres per inch are as follows:





Potatoes.

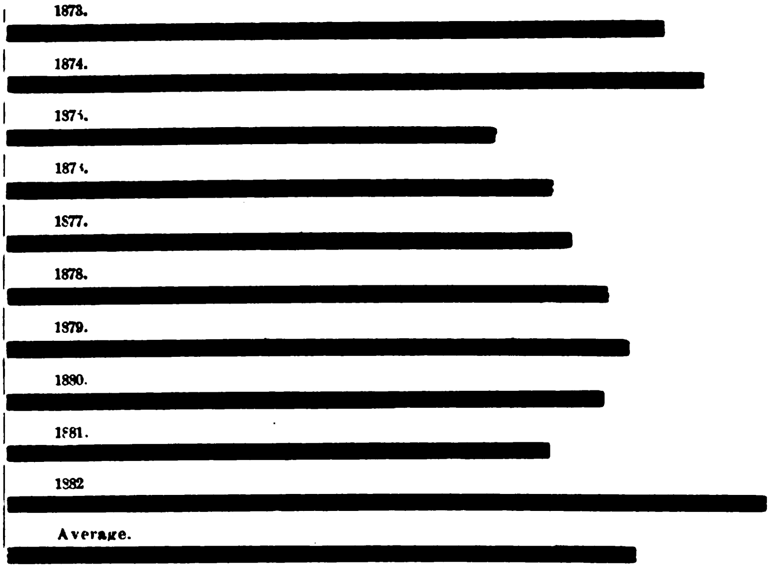
During the past ten years the acreage and annual yield of this crop has been very materially increased, varying from 104,901 acres in 1871, to 172,000 acres in 1882. This variation in acreage, when shown in a scale of 40,000 acres per inch, is as follows:



The yield per acre since 1871, as shown by plate VII, proves the crop to have been subject to great and sudden variations, while plate IV shows the price to have been quite as erratic in its changes. With this crop more than any others, the yield per acre closely affects the prices. The bulk and weight of this product, coupled with high freights and difficulty of transportation in cold weather, all tend to cause the local crop to influence local prices.

Our consolidated crop reports of crops in November indicate a great decrease of yield as compared with the crop of 1881, and it should be further noticed that this increase is greatest in most of those counties which grew the largest acreage, and that from this cause the total yield of the State must be advanced in a ratio greater than is indicated by our tabulated returns, and we are fully warranted in estimating the crop of 1882 at 13,760,000 bushels grown on 172,000 acres, or a yield of eighty bushels per acre. A number of reporters make note of the fact that this crop has rotted badly, (notably in Beaver, Crawford, and Franklin,) and two report the loss from this cause at from forty to fifty per cent. The percentage of unsalable potatoes in the crop of 1882, is much less than in that of 1881, and has something to do with increasing the total yield.

The total annual value of this crop, when reduced to a scale of $2,000,000 per inch, shows the following variations for the past ten years:



In our November reports, Berks, Blair, Bucks, Butler, Delaware, Jefferson, Lehigh, Luzerne, Monroe, Pike, and Sullivan, show a falling off, as compared with the crop of 1881, while McKean reports no change. All the other counties show an increased yield, varying from five per cent. in Centre, to fifty per cent. in Cumberland. When the crop of 1881 is compared with the average crop of the past five years, twenty per cent. report it below, and the remainder report it the same, or at over the average, by amounts varying from two per cent. in Carbon, Chester, and Lebanon, to fifteen per cent. in Perry.

In our report for May, Crawford, Lawrence, and Schuylkill alone show a decrease in the acreage of this crop; Cambria, Chester, Clearfield, Indiana, Snyder, and Tioga, while all other counties report an increase in the acreage, as compared with the crop of 1881, of from three per cent. in Greene, Jefferson, Juniata, Northumberland, and Pike, to twenty-four per cent. in Fayette. When compared with the average crop of the last four years, Crawford alone shows a falling off, while the remaining sixty-six counties indicate a gain of from ten per cent. in Armstrong, Butler, Carbon, Dauphin, Greene, Jefferson, Philadelphia, and Susquehanna, to twenty per cent. in Fayette and Sullivan.

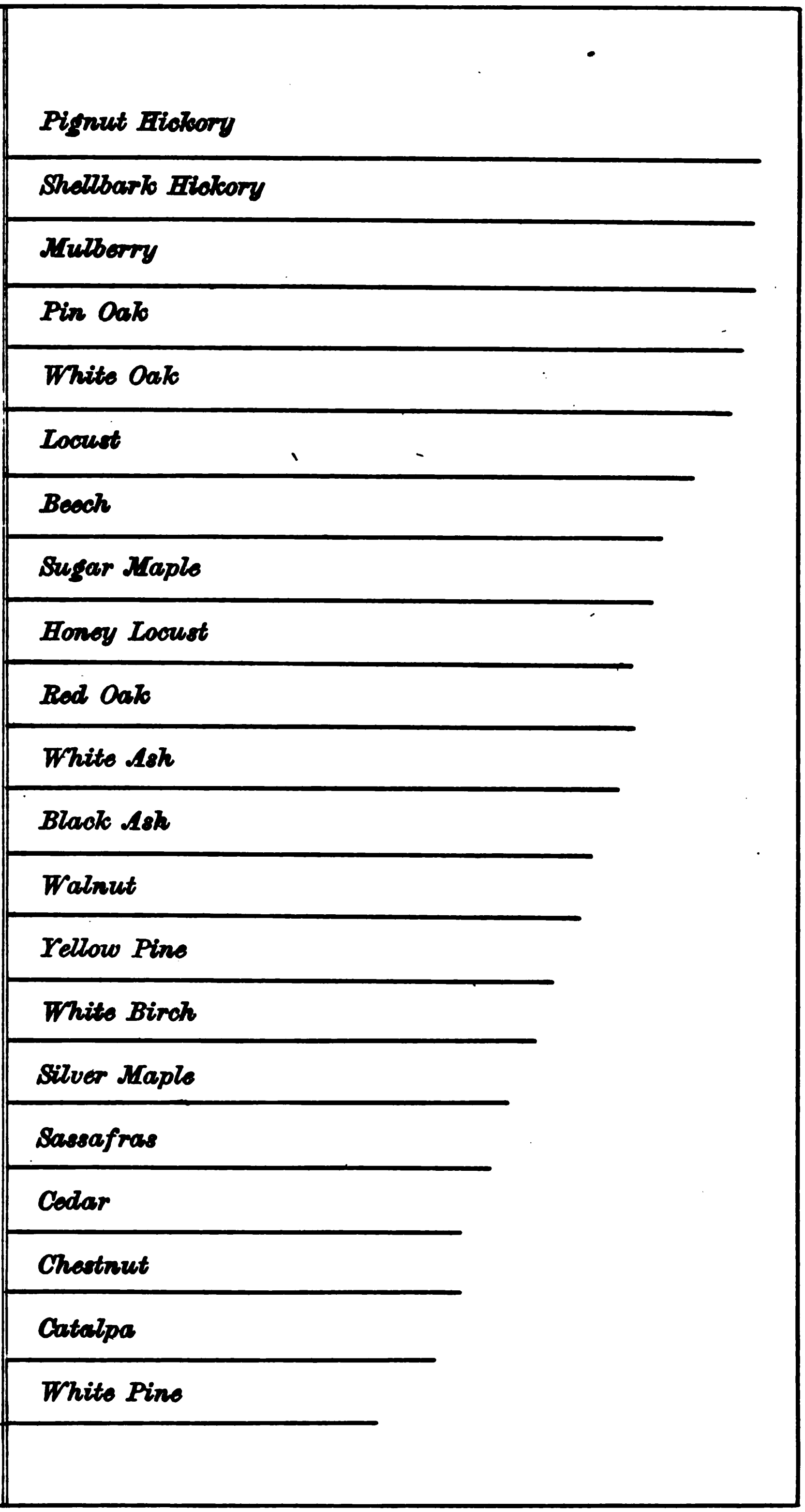
Hay.

The general failure of the grass seed in the stubbles of 1879 and of 1880, very much reduced the yield of 1880 and 1881. The condition of the stubbles of the crop of 1881 being better than for the two preceding years, the cut of hay for 1882 is somewhat better than either of the two preceding years.

In May, Allegheny, Bedford, Blair, Cameron, Centre, Clinton, Lancaster, Lebanon, Mifflin, Northampton, Schuylkill, Warren, and Westmoreland, reported the clover and timothy, in wheat stubbles, as in better con-

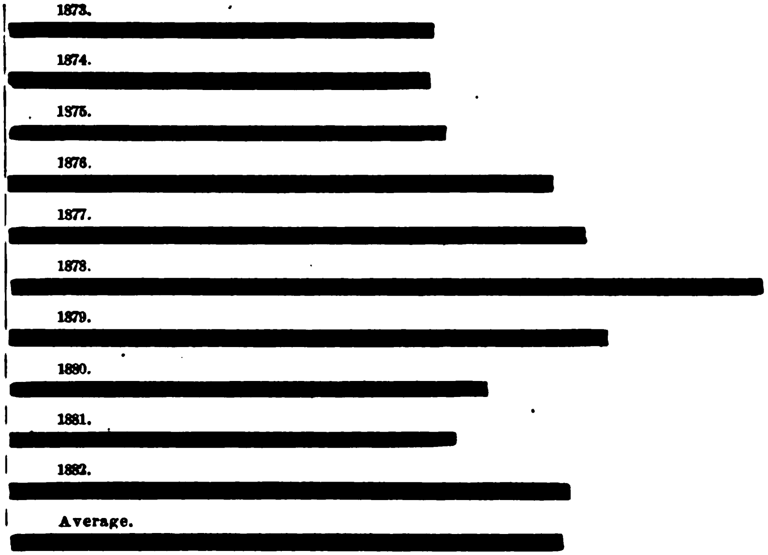
COMPARATIVE FUEL VALUE (DRY) OF 21 KINDS OF WOOD COMMONLY USED AS FUEL IN PENNSYLVANIA.

10th Census.

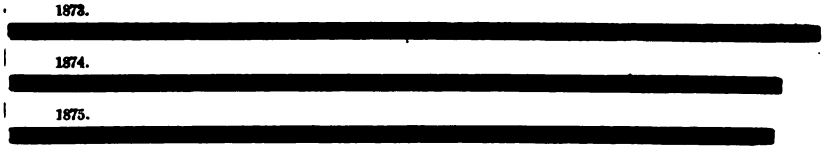


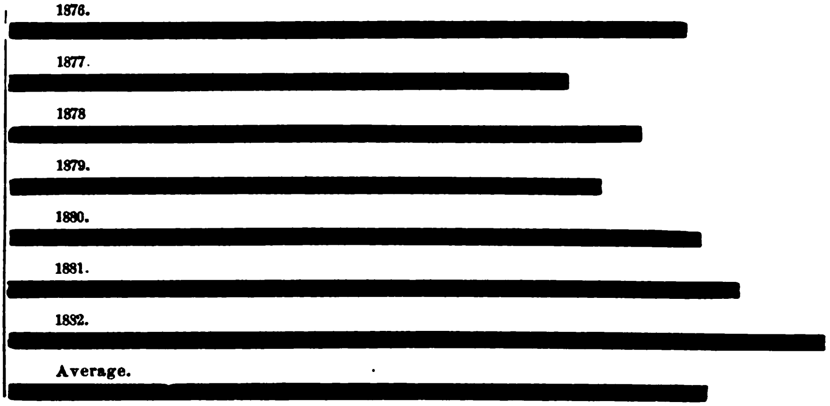
dition than at the same time in 1881, the gain varying from ten per cent. in Allegheny, Blair, Cameron, Clinton, Lancaster, Lebanon, Northampton, and Westmoreland, to twenty per cent. in Bradford and Centre. At the same date, Clinton alone reported the two-year old clover fields in better condition than in 1881, and while twelve counties reported no change in condition, fifty-four reported the condition as below that of 1881, in amounts varying from twenty-five per cent. in Chester, to ten per cent. in Armstrong, Delaware, and Northampton. Similar reports indicate that the timothy stubbles did not suffer in the same degree, and that while forty-two counties reported a falling off in condition, yet in no case did the rate exceed ten per cent. In comparing the condition of the wheat stubbles in May with the acreage of the past five years, no report placed them beyond the average, (Beaver alone rating them as high as the average,) and sixty-six counties reported a decrease in condition, varying from sixteen per cent. in Berks, to five per cent. in Clarion. The acreage is also reported as increased in a number of counties. All the returns warrant an estimation of 2,931,000 tons, from 2,540,000 acres, or at the rate of 1.15 tons per acre.

In comparing the crop of 1882 with that of the seven preceding years, and with the average of the past ten years, on a scale of 1,000,000 tons per inch, we have the following:



At a valuation of fifteen dollars per ton, we have a total value of the crop of 1882 of $43,695,000, and when compared with the value of the crop of the past nine years and with the average of the past ten years, on a scale of $10,000,000 per inch, we have the following:





As indicated by Plate IV the price of this crop is subject to a great range of variation, which, on account of high freight and the bulk of the crop, depends very much upon not only the average yield of the State, but also upon the yield of the locality most directly interested, and perhaps there is no crop grows in Pennsylvania of which the value is more closely regulated by the amount of its yield.

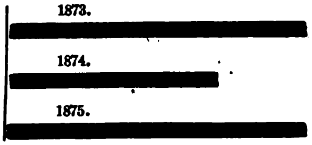
Tobacco.

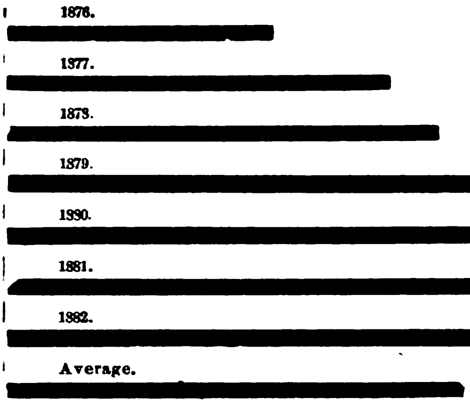
In our tabulated report of "Acreage of Crops," (page 19 of Sixteenth Quarterly Report,) thirty five counties, in comparing the acreage of the crop of 1882 with that of the crop of 1881, with the average crop of the past five years, (both as 100,) furnish us with the following data :

	1881.	Average.		1881.	Average.		1881.	Average.
Adams,	110	125	Franklin,	100	120	Mifflin,	95	107
Bedford,	120		Fulton,	110	123	Montgomery,	107	128
Berks,	107	116	Greene,	102	112	Montour,	95	109
Bradford,	107	125	Huntingdon,	112	117	Northampton,	100	107
Bucks,	160	115	Indiana,	100	109	Northumberland,	103	105
Centre,	90	110	Juniata,	115	124	Snyder,	103	115
Chester,	115	150	Lackawanna,	103	107	Tioga,	110	117
Clinton,	100	125	Lancaster,	105	120	Union,	102	110
Cumberland,	98	110	Lebanon,	100	145	Wayne,	102	110
Dauphin,	110	117	Lehigh,	102	114	Westmoreland,	95	105
Delaware,	111	120	Luzerne,	100	111	York,	104	110
Elk,	87	125	Lycoming,	90	112			

This data, coupled with the results of special correspondence, warrants us in estimating an area planted with this crop in 1882 at 25,000 acres, with a yield of 28,750,000 pounds, or at the rate of 1,150 pounds per acre.

By a careful comparison of the estimates of the United States Department of Agriculture, the census of 1880, and our own data, we give the crops of the past ten years, on a scale of 10,000,000 pounds per acre, as follows :

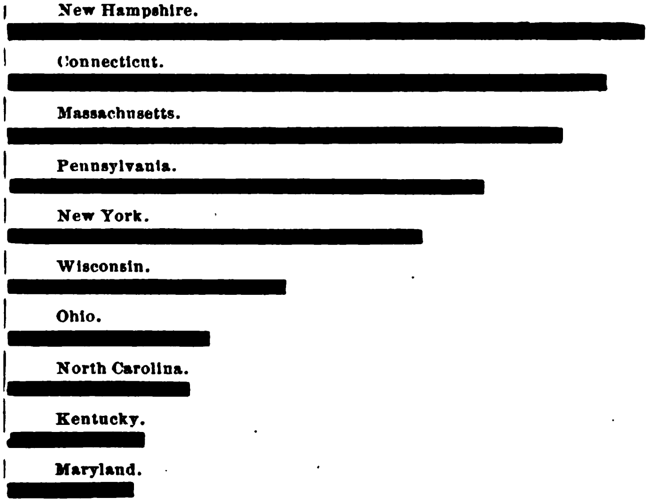




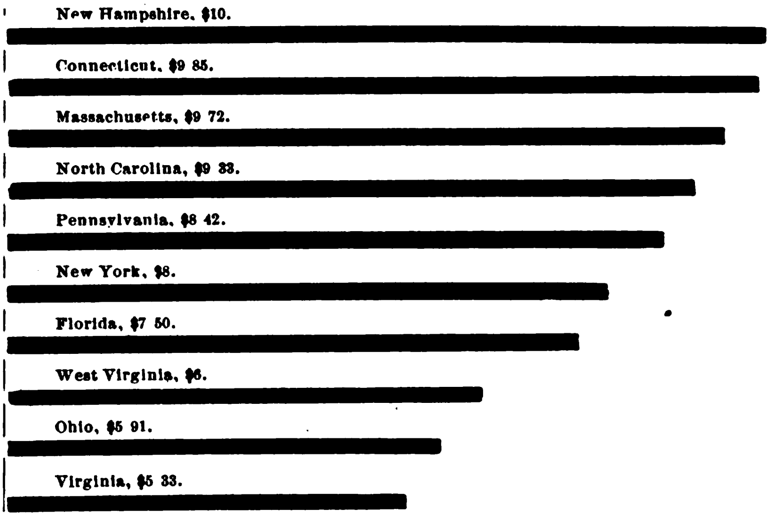
One of our most reliable correspondents, who has special facilities for furnishing an opinion, estimates the tobacco crop of Lancaster county from 1860 to 1872 at two hundred and twenty-five thousand cases, or ninety million pounds. The same authority estimates the crop of the county for the past ten years as follows:

	Cases.	*Pounds.*
1873,	25,000	10,000,000
1874,	30,000	12,000,000
1875,	40,000	16,000,000
1876,	35,000	14,000,000
1877,	37,000	14,800,000
1878,	38,000	15,200,000
1879,	45,000	18,000,000
1880,	40,000	16,000,000
1881,	35,000	14,000,000
1882,	30,000	12,000,000
Total for the ten years,	355,000	142,000,000

From the tenth census, we obtain data which furnish us with the following comparison of the value per acre of the crops of our ten leading tobacco-producing States:



The estimated cost per hundred pounds in ten States is shown as follows:



LIST OF OFFICIAL REPORTERS AND CORRESPONDENTS

Appointed by members of the Senate and House of Representatives, session of 1881.

ADAMS—R. Sherfy, Gettsburg; A. W. Storm, East Berlin; D. P. Forney, Hanover; E. Maginly, Fairfield.

ALLEGHENY—John Gilfillan, Upper St. Clair; J. R. McMichael, Beech Cliff; Wm. H. Magill, Rural Ridge; S. J. Chamberlain, Gill Hall; Henry Thompson, Glenfield; Jno. Voegtly, Bennett; H. R. Chalfant, Wilkensburg.

ARMSTRONG—Andrew Ivory, Slate Lick; T. H. Allinson, Kittanning; James Hestelgesser, Worthington; J. W. Titley, Sherrett; S. Hamilton, Oakland.

BEAVER—George Hattie, New Brighton; W. Ewing, McCleary; J. Dillon, New Galilee; J. S. Elder, Darlington; John S. Little, New Galilee; Robert Sterling, Seventy-Six.

BEDFORD—Daniel Fletcher, Clearville; William Donahue, Bean's Cove; W. C. Lutz, Bedford; W. Mason, Cook's Mills; D. Z. Replogle, Waterside; William Elder, Buffalo Mills; Joseph E. Noble, Waterside.

BERKS—Jacob G. Zerr, Geiger's Mills; Ezra High, Reading; Oliver D. Schock, Berks; D. Y. Peter, Lobachsville; L. K. Balthaser, Bernville; D. B. Mauger, Douglassville; F. B. Hassler, Hamburg.

BUTLER—Simeon Nixon, Maharg; A. D. Weir, Freeport; Alf. Meals, Coulterville; William Martin, Eue Claire; Finlay Weimer, West Liberty; Hugh Braham, Harrisville; J. P. Robinson, Glenora; W. C. Waldron, Breakneck; J. W. Christy, Coultersville; J. P. Little, Harmony.

BLAIR—William P. Smith, Hollidaysburg; W. McAlister, Royer; JosephWagner, Williamsburg; W. McCormick, Sinking Valley; Thomas Trout, Sr., Sabbath Rest.

BRADFORD—A. T. Lilley, LeRoy; E. J. Ayres, Asylum; Thomas J. Howie, Ulster; E. Pomeroy, Troy; G. Landon, Herrick; P. H. Buck, LeRaysville; Justus Taylor, Wyalusing; Wm. Snyder, Sheshequin; H. L. Scott, Towanda; Ward Warren, Canton; L. M. Leonard, Grandville Centre.

BUCKS—Henry C. Hartzell, Telford; W. M. Large, Doylestown; E. Reeder, New Hope; David McNair, Richboro'; John M. Zuck, Zion Hill; Davis E. Brower, Doylestown.

CAMBRIA—Lemuel Davis, Ebensburg; James McCance, St. Augustine; J. P. Stalb, Grant; Valentine Bishop, Loretto; Alva Akers, Johnstown; John P. Strayer, Johnstown; G. W. Osbourne, Johnstown; John Mannion, Carrollton; J. Beaver, Carrollton; J. S. Kaylor, Loretto.

CAMERON—C. H. Sage, Emporium; V. A. Brooks, Sterling Run; G. B. Barclay, Sinnemahoning.

CARBON—W. H. Knecli, Weissport; D. Kalbfuss, Mauch Chunk; D. R. Keller, Hudsondale; R. Zeigenfuss, Lehigh Gap; W. E. Kemmerer, Weissport; Reuben Steiner, Hudsondale.

CENTRE—L. Rohne, Centre Hall; John A. Woodward, Howard; John A. Hunter, Half Moon; A. Hoy, Bellefonte; D. Weiland, Linden Hall; Christian Alexander, Millheim.

CHESTER—C. C. Moore, Milford Mills; Thomas Hope, Pomeroy; W. Shelmire, Avondale; W. Swayne, London Grove; W. W. Parker, Parkerville; Thomas H. Windle, Coatesville; S. H. McConnell, Rockville; Joseph W. Sharp, Berwyn; I. Acker, Rosenvick.

CLARION—John Henlen, Fryburg; L. F. Randolph, New Athens; I. Neely, Alum Rock; James B. Lawson, Lawsontown; Jacob Bittenbender, Curllsville; David H. Parsons, Limestone.

CLEARFIELD—S. L. Kester, Grampian Hills; L. Denning, Clearfield; H. L. McGhee, Ostend; L. Hubler, Grahamstown; Miles Wall, Curwensville; Richard Hughs, Oceola Mills.

CLINTON—J. A. Herr, Cedar Springs; Coleman Grugan, Hyner; M. Quigley, Youngwomanstown; J. McGhee, Glen Union; Isaac Frantz, Tylerville; Jacob Stamm, Pine; J. D. Engle, Beech Creek; Hamilton Fish, Hammersly's Forks.

COLUMBIA—Peter A. Evans, Bloomsburg; J. Sutton, Stillwater; E. W. Tewksbury, Catawissa; A. P. Young, Millville; N. W. Brown, Mainville; Chandler Eves, Millville; George W. Uett, Rohrsburg; John S. Kline, Benton.

CRAWFORD—James G. Bramhall, Centreville; J. S. Kean, Evansburg; O. L. Williams, Meadville; F. Schreiner, Oil Creek; S. P. Warriner, Center Road; Thos. Van Horne, Meadville; Jos. Patterson, Custard's; H. M. Cutshall, Guy's Mill; M. W. Oliver, Springboro'; R. M. Range, Lincolnville.

CUMBERLAND—David H. Worst, Shepherdstown; T. Chambers, Middlesex; H. Stewart, Carlisle; F. Watts, Carlisle; T. Anderson, New Kingston; G. R. Dykeman, Shippensburg.

DAUPHIN—Isaac Mumma, Highspire; I. B. Nisley, Middletown; H. B. Schriner, Gratz; James Calder, Harrisburg; Simon Shirk, Linglestown; Ed. Hoofnagle, Progress; Hillery Schreiner, Gratz; Henry Hartman, Berrysburg.

DELAWARE—William Powell, Concordville; John D. Pierce, Concordville; E. Hood, Newtown Square; J. Trimble, Concordville; G. Drayton, Ivy Mills.

ELK—Will Dickinson, Ridgway; J. L. Brown, Wilcox; J. C. McAllister, Brandy Camp; J. W. Gray, Benezette; J. C. Hytle, Brandy Camp.

ERIE—William M. Brown, Erie; J. C. Thornton, Avonia; William Phelps, Waterford; Warren Chaffee, Wattsburg; W. L. Drown, McKean; S. V. Holliday, North Springfield; V. R. Gillett, Lebœuf; H. S. Southard, North-East; J. Miles, Milesgrove.

FAYETTE—Henry Galley, Dawson; Jesse V. Hoover, Masontown; Silas R. Provins, Masontown; Julius Dun, Smithfield; William Beesom, Uniontown; W. L. Smith, Farmington; David Morgan, Morris Cross-Roads; Robert Hogset, Uniontown.

FOREST—J. I. Range, Stewart Run; Orion Siggins, West Hickory; W. Cook, Cooksburg; A. B. Kelly, Tionesta; W. P. Siggins, West Hickory.

FRANKIN—Henry Etter, Lemaster's; R. Chambers, Chambersburg; J. B. Cook, Fayetteville; John Webster, Mercersburg; B. F. Winger, Greencastle; W. C. Knight, Chambersburg; John C. Walker, Fannettsburg.

FULTON—Henry Wishart, Wells' Tannery; Mark Dickson, McConnellsburg; B. E. Barton, Harrisonville; W. P. Gordon, Warfordsburg.

GREENE—D. A. Spragg, Spraggs; J. G. Patterson, Carmichael; S. C. Orr, Jefferson; A. V. Dillie, Wind Ridge; B. H. Clark, Waynesburg; John Walker, Ruffston; George Wisecarver, Waynesburg; Emanuel Beale, Davistown.

HUNTINGDON—Livingston Robb, McConnellstown; R. Crotzley, Colfax; S. McVittey, Saltillo; C. Wakefield, Allenville; R. McDevit, Huntingdon.

INDIANA—P. M. Hodge, Blairsville; Cyrus Stouffer, Blairsville; T. B. Elder, Elder's Ridge; Joseph Shields, Trade City; Moses T. Work, Brady; Robert Allison, Indiana.

JEFFERSON—Charles A. Carrier, Richardsville; I. B. Conser, Punxsutawney; Thomas Holt, Stanton; J. North, Punxsutawney; W. C. Smith, Rockdale Mills; James A. McCracken, Jr.. Frostburg; Oran S. Carey, Bell's Mills.

JUNIATA—Lewis Burchfield, Patterson; James North, Patterson; W. Banks, Mifflintown; G. W. Graham, Port Royal; J. Patterson, Peru Mills; J. V. Moore, Van Wert.

LACKAWANNA—H. P. Jacobs, Hyde Park; A. C. Sisson, La Plume; George Y. Haines, Spring Brook; W. H. Hierlihy, Scott; Frank Bundage, Lenoxville; Clark Lowry, Green Grove; John P. Cramer, Carbondale; Frank H. Freeman, Hyde Park; John G. Highfield, Scranton.

LANCASTER—Ephriam Hoover, Lancaster; M. D. Kendig, Cresswell; W. H. H. Kinzer, Terre Hill; William T. Clark, Chestnut Level; Henry N. Kehler, Columbia; Thomas Baker, Octoraro; J. J. Brinton, Christiana; Johnson Miller, Litiz; H. M. Engle, Marietta; H. B. Gish, Elizabethtown.

LAWRENCE—Samuel Witherspoon, Enon Valley; George Book, Edinburg; Robert B. Clark, New Wilmington; H. McCowan, Enon Valley; Martin Reno, New Castle; James M. Lawrence, Plain Grove.

LEBANON—John K. Bomberger, Bismarck; C. Forney, Lebanon; J. W. Grove, Fredericksburg; I. W. Groh, Shafferstown; M. Bachman, Fontana; George W. Kline, Lebanon.

LEHIGH—Daniel Kern, Coopersburg; N. G. Hoffman, Orefield; Charles H. Blank, Coopersburg; Hiram S. Shantz, Wescosville; D. H. Creitz, Jacksonville.

LUZERNE—Marvin W. Kimble, Kimble; Sylvester Dilley, Wilkes-Barre; Alfred McMurtrie, Conyngham; W. J. Honeywell, Dallas; Michael Graham, Plymouth; Irvine Miller, Exeter; S. W. Trimmer, White Haven; Z. S. Stevens, Cambria.

LYCOMING—Peter Follmer, Williamsport; Daniel Steck, Hughsville; Frank Porter, Montgomery Station; M. P. Hepburn, Jersey Shore; R. R. Nesbit, Nesbit; Joseph Hill, Rose Valley; Isaac Bruner, Muncy.

McKean—William K. King, Ceres, New York; D. Ramer, Smethport; John Corvin, Kendall Creek; J. H. Duntley, Smethport; D. Sampson, Turtle Point; D. J. Keys, Eldred; Casper Smith, Farmer's Valley; G. Moody, Coryville.

Mercer—J. D. Kirkpatrick, North Liberty; T. B. Roberts, Leeches Corners; D. Robinson, Hermitage; Irvin Brown, Greenville; Amos Taylor, Mercer; A. Robinson, Mercer; M. Devlin, Otter Creek; Samuel Cole-Centreton; Elijah Baker, Sharon; James Satterfield, Wheatland.

Mifflin—J. Campbell, Belleville; John K. Hartzlen, McVeytown; David M. Zook, Belleville; C. Y. Peachy, Belleville; A. T. Kyle, Reedsville.

Monroe—Jacob J. Angel, East Stroudsburg; W. H. Rinehart, Jackson Corners; N. H. Coolbaugh. Coolbaugh's; F. B. Overfield, Coolbaugh's; William Gilbert, Pleasant Valley; Frank H. Smith, Shawnee; Felix Stoner, Brodheadsville.

Montgomery—W. H. Holstein, Bridgeport; S. Powell Childs, King of Prussia; Ellwood Roberts, Hoyt; Henry Fry, Limerick Station; Seth T. Walton, Willow Grove; David Stevens, Abington; Solomon K. Grinley, Schwanksvilles; Mark R. Supplee, King of Prussia; Hamilton Egbert, Bryn Mawr; Elias Fogley, Fogleysville; George Erb, Douglass.

Montour—Ira Stitler, Washingtonville; M. D. L. Sechler, Danville; E. Sidler, Danville; J. Shearer, Washingtonville.

Northampton—Paul Kleppinger, Nazareth; Charles N. Steckel, Bath; Stephen Anewalt; Weaversville: George Boyer, Kreidersville; George W. Heiney, Cherryville; Josiah J. Ealer, Easton; R. H. Merrill, Middaugh's; Asher D. Shimer, Bethlehem.

Northumberland—J. Derr, Sunbury: W. Fullman, Milton; G. Smith, Mahoning; C. P. Reinhart, Sunbury; W. W. Watson, McEwensville.

Perry—B. F. Jackson, New Bloomfield; D. B. Milliken, Landisburg; Robert P. Cochran, Millerstown; B. F. Hall, Sherman's Dale.

Philadelphia—M. W. Birch, 1868 Frankford Road; William E. Hamell, Frankford; William Rigli, Paschallville; Lester Comly, Byberry; G. W. Rhawn, Fox Chase.

Pike—S. Roland, Rolands; M. C. Westbrook, Blooming Grove; S. Cuddeback, Milford; C. Swartwout, Delaware; William Cromwell, Hawley; James Rose, Matamoras; E. J. Baker, Milford.

Potter—H. T. Reynolds, Brookland; S. D. Estes, Oswego; J. W. Allen, Coudersport: J. E. Harvey, West Bingham.

Schuylkill—Albanus Riland, Friedensburg; J. L. Nutting, Pinegrove; John E. Fertig, Rock; T. N. Shollenberger, Pottsville; H. B. Greaff, Tamaqua; George A. Ely, Weishample.

Snyder—Lewis E. Pawling, Salem; D. Kepler, Mt. Pleasant Mills; Henry Moyer, Salem; Philip Hilbush, Selinsgrove.

Somerset—Samuel Philson, Berlin; Albert G. Will, Glade; N. Scott, Ursina; John W. Beachy; Elk Lick; Peter Heffley, Somerset; C. C. Musselman, Somerset; J. W. Hay, Elk Lick.

Susquehanna—T. T. Birchard, Birchardville; E. K. Norton, Aldenville; O. Washburne, Gelatt; A. Griffis, Montrose; G. H. Harvey, Rush; J. J. Jennings, New Milford; J. C. Morris, Friendsville.

Sullivan—B. Vaughn, Sciota Vale; L. B. Speaker, Hillsgrove; Richard Bedford, Campbellsville.

Tioga—J. Klock, Wellsboro'; Charles Tubbs, Osceola; Charles Buckley, Osceola; L. Gray, Mainsburg; D. G. Edwards, Cherry Flats.

Union—Elisha Shorkley, Lewisburg; J. P. Follmer, Cairo; George A. Stahl, Lewisburg; R. V. B. Lincoln, Laurelton; S. Cligan, Kelly Point.

Venango—William Gates, Rockland; J. G. Siggins, Pleasantville; R. L.

Cochran, Franklin; J. A. Allen, Wesley; J. P. Byers, Cooperstown; T. S. Strobecker, Cooperstown; James Russell, Waterloo.

Warren—G. P. Meade, Youngsville; Emery Davis, Sugar Grove; Daniel Lott, Lottsville; R. M. Sears, Columbus; F. R. Miller, Sugar Grove; E. A. Allen, Freehold.

Washington—W. L. Archer, Burgettstown; Henry C. Slusher, Sunset; James Simpson, Cross Creek Village; M. H. Boreland, Cecil; H. T. Bailey, Amity; W. K. McIlvain, Vanceville; Frank Rodgers, Coon Island; S. S. Campbell, Patterson's Mills; J. W. Hanlin, Hanlin Station: W. C. Work, Buffalo Village.

Wayne—T. J. Crocker, Boyd's Mills; E. W. Hamlin, Bethany; Calvin E. Kirkpatrick, Tallmanville; H. K. Stone, Pleasant Mount; George W. Simons, Hamilton; N. F. Underwood, Lake Como.

Westmoreland—Adam Stoner, Stoner's; Archy Boyd, West Newton; Thomas Donohue, Greensburg; M. Keffer, Jr., Ligonier; Hortensus Lowry, West Newton; William Carothers, Irvin Station; William Ross, Parnassus; John Beatty, Jr., Beatty; Henry Wister, Oakland Cross Roads.

Wyoming—H. H. Mitchell, Lemon; G. W. Fassett, Scottsville; James Bunnell, Tunkhannock; O. E. Reynolds, West Nicholson; G. Roberts, Falls; T. D. Walter, Mill City; Mark Keeney, Golden Hill; Lewis Armtage, Factoryville; Chancey Reed, Keelersburg.

York—Israel B. Zeigler, Weiglestown; P. U. Strausbaugh, Menges' Mills; William Eyster, West Manchester; A. H. Glatz, York; John N. Logan, Dillsburg; John B. Gemmell, New Park; E. H. Gerry, Shrewsbury; Robert Kohler, New Freedom; H. Keyser, Airville.

REPORTERS' NOTES, OCTOBER, 1882.

Allegheny, W.—The outlook for the coming winter is excellent. Farm stock of all kinds in very good condition, and with an abundance of feed and fodder, their condition can be easily kept up. The fall crops are in good condition, the abundant rains making a rapid and healthy growth both in the grain and pastures. The fruit crop of apples, peaches, plums, and cherries were an entire failure, owing to the April freeze. Grapes rotted badly. Berries very abundant. Farm stock healthy, no diseases of any kind in this section,

Armstrong.—In our section the principal drawback this year was the failure of the fruit crop. We had scarcely any apples, no peaches, and very few pears. The oats was somewhat hurt with rust, but was still a better yield than last year. We have had a beautiful fall—not too warm, but a pure and invigorating atmosphere, with enough rain to moisten the ground nicely for the growing crops.

Beaver, N. W.—The past quarter has been dry and cold at night, not favorable for growth of wheat or pasture. We have not near so good a growth of either as this time last year. First frost, morning of 15th October, done no damage to vegetation. Every acre sown to wheat this fall that was available. Corn better than supposed in August, two thirds of the crop matured. Oats hurt with rust, are below an average. Potatoes below an average, and rotting badly. There is no fruit in this section. Clover-seed sown in spring of 1881 was almost a complete failure. That sown in 1882 a good catch. Heavy frost on morning of 20th. First frost to kill vegetation.

Beaver, C.—October 20th, and the first frost this morning that has killed the cucumber vines. This has been one of the most beautiful autumns in the memory of man in this section of country. We have been free from wind-storms, which frequently do so much harm to fruit trees, but have had fine warm weather, with timely rains, which has kept the face of nature more like June than October. Pasture for stock never was better, nor fewer cattle to consume it. Both dry and milch cows seem to be scarce, and a good fresh cow is worth fifty dollars. Several of our farmers have gone to the Allegheny drove-yards for dry stock to feed this winter; having had good crops the past season, feed of all kinds is plenty. There is a good acreage of wheat sowed this fall, and I never saw the ground in better condition for plowing, and consequently the seed was well put in, and in most cases there is a beautiful stand of wheat. There is a great deal of phosphate used on the wheat here. Farmers find it profitable. The late frost on May 3 killed most all the apple blossoms, with the exception of Rambo, Newton Pippin, Rome Beauty, and Northern Spy. In planting an orchard, it would be advisable to bear in mind to plant a few late blossoming kinds, in case of late frosts. I have forty-five varieties of apples, but I got more fruit off the four named above than the other forty-one.

Beaver, C.—Hog cholera still all over the county. One half the hog stock has died. There appears to be no relief, and three fourths of the stock is left unburied and causes the disease to spread like wild fire. Could not the Legislature be prevailed upon to pass an act to have all such that die with contagious diseases buried, and impose a heavy fine on all who do not comply, and make it the duty of all sworn officers to return any and all parties who fail therein? Hogs have been thrown in our rivers this fall, and doctors claim it a partial cause of a fever now prevailing in this section.

It has been asserted that feeding hogs salt at regular intervals, the same as other stock, that it would prevent the cholera. I had the cholera among mine, and divided my stock, took the sick from the well as soon as noticed and fed salt every day, although I lost all affected ones, none that were not affected when I commenced feeding salt have been affected, and I feel satisfied that salt will, if not wholly, partially prevent cholera.

The apple crop has been an entire failure in our county, also peach crop. Some claim from late spring frosts, but I found before the frost that the bloom was not perfect, the center being of a dingy yellow color, and it is my belief that the drouth last summer had more to do with the failure of the fruit than the late frosts.

The wheat is not yielding as well as expected according to the straw.

Corn is not near as good as expected, yet much better than last year. Will make three fourths of a crop. The storm in September has blown it all down and has retarded the cutting of it.

Potatoes have yielded well, say an extra crop, but have commenced rotting, and in some sections one half of the crop have rotted. I know from my experience that one half have rotted. Some claim that they should have been dug sooner, but it has failed to prevent rotting from observation of those dug and those not. I see no difference. I have, I believe, stopped the rot in mine by putting in bins in a cellar and in light layers and sprinkling them until white with slacked lime. I have done this before and found it good, and find it more so this year than usual, (it destroys the fungus that causes the rot.)

The wheat crop is not yet fully sown here, owing to the rain. There will be a shrinkage in the acreage. This is the latest seeding known in this section for twenty years.

The crops of grapes in some sections are short, on account of the pore bug destroying the bloom.

BERKS, N.—There is a disease among swine which proved very fatal, but is again on the decrease. Some affection of the throat of which they die very suddenly. Symptoms, swelling of the throat, loss of appetite, &c. Appears to be contagious. Abortion among cows is still very prevalent, and raging among common stock as well as blooded. No remedy has been found thus far, as well as no cause for the same. Peaches have been much injured by the late cold spring and dry summer. Apples, by the codling-moth and the same injurious cause as the peach.

BERKS, C.—In making up the notes for the summer of 1882, I would remark that, in my opinion, the cereal crops were all a good average crop; oats a little more than half a crop, owing, perhaps, to the cold snaps in the spring; corn, nearly a full average crop. Apple, three fourths of a crop compared with crop of 1880, and three times as many as in 1881. Clover and timothy, in wheat and rye stubbles, excellent; never saw a better set. It seems as though clover seed sprouted that had been lying in the ground many years. Pastures are fresh and abundant for this time of year. Wheat-sowing finished, making a nice and even growth. Some complaint of larvæ of the Hessian fly in early sown wheat. Not much damage feared.

BRADFORD, N.—The number for corn may appear to you to be high, but last year corn was nearly a failure; although a light crop this season, fully as much as marked over last year. Clover-stubble two years left blank, as last winter killed all clover, but has, at present, a fine showing. Artificial grasses are not much cultivated, except timothy, clover, and red-top, white clover being natural to some sections of this locality. Rye is not raised as a crop in this section; only in small patches for straw, used chiefly for tying corn-fodder. The potato crop very uneven. The planting on low ground, too wet early; later, severe drouth; on such, very short. but some of the finest crops ever raised. Much interest taken in new varieties and cultivation in general. Had a fine promise in early spring for the apple crop. They commenced dropping off, and continued to do so the entire season, and those remaining on trees are scrubby and imperfect. Cause unknown.

BUCKS, C.—The agricultural editor of the Cincinnati *Gazette* having seen some mention in the Doylestown papers of our success in potato growing, recently addressed to me a letter, asking "how to raise three hundred bushels of potatoes on an acre of ground." Thy circular soliciting notes pertaining to agriculture, I thought it might be of interest to thee to read the response given to the aforenoted interrogatory. The field devoted to potatoes was manured, and had corn grown upon it last year. Late in the fall, after the crop had been gathered, the butts were hoed off close to the ground, and then turned over to the depth of seven or eight inches, plowing *all* the soil, and sometimes a little of the sub-soil. After which, ten ponderous four-horse loads of Philadelphia manure, weighing from four tons to ninety-five hundred each, were spread broadcast upon the surface. As a matter of course, some decomposition was going on through the winter, and the liquids from the rains and frosts were taken up by the mellow soil, leaving it, in the spring time, in that loose friable condition that the potato delights in. The potatoes were planted the second week in the four month, (April,) in every other furrow, not so deep as to be *below all the soil*, and thirty hundred of phosphate sowed in the rows. Thus closely planted, the tops soon shade the ground, a point of importance in the shape of retaining moisture that would otherwise be absorbed by the rays of the sun. The ground was then rolled down, and harrowed. About the time they began to come up, they were again harrowed; then worked several long-shanked chisel-teeth, set in a cultivator frame, shut together so as to pass between the closely-planted rows, penetrating the soil as deep as the fall plowing; and, lastly, with a large tooth, purposely made, casting the dirt either way, hilling them up to a moderate extent. Not advisable to work among them after the blossom makes its appearance. The four and one half acres of kind chocolate sandy loam, upon which twelve hundred bushels of Early Rose potatoes were raised the current year, and more than one hundred bushels of corn to the acre upon the same surface five years ago, has a beautiful southern exposure, fringed by a turnpike, that makes fourteen per cent. dividends, elicited many ecstacies of admiration from the numerous traveling public during the time of bloom and blossom. A crop that was given our best attentions, not solely for the enjoyment the raising of such a yield affords, but for the dollars that will be harvested therefrom. Our present expectation is to increase the next year's crop, with alike favorable chances, should they be meted out to us, by stirring the sub-soil in the bottom of the potato row before dropping the seed; not that sub-soil possesses any unheard-of propagating quality, but the benefit that will arise from its acting as a sponge or reservoir, as well as for the better expansion of the roots which grow below the tubers.

The caterpillar hereabouts has been frightfully destructive, eating the foliage from off all grape vines and fruit trees, save the peach. Lately noticed an orchard in an adjoining township, that every leaf had been devoured from the trees, coating the apple with their web, thereby checking the growth of the fruit to such an extent as to make them almost worthless.

Bucks, N.—The dry weather has injured the corn to a great extent. Rain came about two or three weeks too late. But the corn crop in our district is still more than double that of last year. Second crop. Hay is about same. The wheat and rye crop turned out much better than was expected at the time of my last report. Some fields were excellent, still there were some poor fields. Hay crop was very good. Oats not as good as last season. It suffered from rust or mildew. Apple crop is just middling. Potatoes are good. They have still suffered to a great extent from the drought, but there are enough to supply the demand. There is no special disease among cattle that I know of. But a good many farmers have lost valuable cows during the last two weeks from having them pastured in young clover fields. Twelve have died that I know of within four miles circumference. Is there no remedy to prevent it? I think it is a case worthy to be taken into consideration when the cattle are so high. The only preventive I know of is to feed the cattle in the morning something dry, such as bran and a little hay, before letting them out. Good cows are worth from sixty-five to eighty-five dollars. The grain fields have a nice appearance. The ground is wet and the weather warm. The stubble fields never looked better, and by the appearance a good crop of hay is to be expected next summer, but still we don't know how much it will suffer during winter.

Butler, N. E.—Total failure of apples, pears, peaches, and cherries on account of a very late frost. Strawberries and wild berries were a full crop. Grapes were badly damaged by the rose bugs. Cabbage was damaged with a green worm. The oats crop was damaged with too much rain, which was the most for twenty years. The clover crop was poor on account of the past open winter.

Butler, N. E.—Spring planting late on account of wet weather. Planting done about May 25 to 30. Season very wet with late frosts, which injured stem of apples so they fell off. Oats in this section badly damaged with wet in harvesting them. Grape crop injured by cold rains in August.

Potatoes injured by some cause. The corn crop stood well, and came out in good order and of good quality. Fall grain is looking well. Cabbage a partial failure on account of "big root." Onions good, and worth seventy-five cents per bushel. Beets good. Tomatoes good, but somewhat injured by rot in the vines.

CAMBRIA, N.—The season has been very wet—wet to such an extent that farmers have not been able to get their fall crops in in season or good condition, although there has been a acreage sown. The oats crop was not so good as it should have been, appearing to have been injured by a small fly or insect, the ravages of which caused the leaves to turn a reddish color, almost resembing rust. The fruit crop is almost a failure, apples being the principal fruit here, and this season there are very few orchards that have anything of a crop. Pears generally do well, but there are but few trees and no regular pear orchards. But for the curculio, plums would do well. Disease among cows, not properly understood, has prevailed to a limited extent.

CENTRE, M.—Farmers through the center and southern part of the county have lost many swine by cholera, being ill but a few days until they would die. Apples, pears, and peaches almost an entire failure. Grapes in abundance, but three weeks later than usual. The corn crop is better than last year, but the cold summer was not favorable to a large yield. Wheat was slightly damaged by rust; does not yield as well as expected. Wheat was sown as late as the 6th of October. On account of wet weather, sowing was much retarded, but is growing well.

CHESTER, S.—The effect of the past season on the crops has resulted in a far larger yield than the prospect warranted when the spring reports were made out; particularly was this the case in the hay crop, which, instead of being very light, was heavier than usual, the growing weather postponing harvest time and increasing the quantity of grass, almost miraculously, as *apparently* there were in many cases no roots left by last year's drought. The cabbage worm has done a great deal of damage, but not nearly so much as last year, but the hairy caterpillar has been extremely numerous and destructive, particularly to the apple trees. I notice that some of our regular bearing apples, notably the White, Doctor, and Smith's Cider, have not borne fruit this season, and the leaves look small and stunted, as though blighted. I have not heard of the potato weevil (which was destructive in some fields last year) being about this year. We have had no frost yet and plenty of rain, so that pasture and garden vegetation are still abundant.

CHESTER, N. W.—Owing to last year's short corn crop, horses are not in as good condition as usual. Wheat stubbles, clover, and timothy fields never were more luxuriant, and give promise of a heavy hay crop next year. Cows and young stock in good health. Some loss of poultry from cholera.

CLARION, S. E.—Season very wet. Wheat good and of extra quality, with heavy yield of straw. Oats heavy in straw but light in grain, some weighing but fifteen pounds per bushel. Hay good, weather in harvest wet, and some hay lost, and much more injured. Grass seed sown last spring looks well. Some hogs lost from cholera.

CLARION, S. W.—On account of cold rains last spring, harvest in this section was two weeks later than usual. Wheat, rye, and oats, a fair average crop, but oats is light in weight, on account of rust at time of ripening. Corn and potatoes are a fair average crop. Potatoes rotted to some extent. Buckwheat is more than an average crop. This year wheat looks healthy, and is growing nicely. Have had an abundance of rain here all through the past season. Fruit of all kinds almost a total failure. Cause, late freezing and frosty weather last spring. Berries a fair average crop. Live stock healthy, and in good condition.

CLEARFIELD, C.—Our fruit crop was very small, owing, I think, to long-continued wet, and late frosts. Last spring we had a full bloom, and on June 1st the trees were well set with fruit, but the farmer that has gathered one hundred bushels has yet to be heard from. The increased acreage in wheat this fall, I think, is due largely to the use of commercial fertilizers, which was introduced in the county last year, and gave good results. Meadows and pastures are in the best condition I have ever seen them at this season. They are in marked contrast with this time last year, when everything bore a *scorched* appearance; in consequence live stock of all kinds are in good condition, barns and granaries full, and farmers generally happy. Fully $150,000 went out of the county for grain, in consequence of last season's drought, since last harvest, (1881.)

CLINTON, S.—The dry summer had almost discouraged the farmers in raising corn, but the August rains came in time to produce a partial crop. The corn crop of 1881 here was so very poor, that the present crop rates high compared with it. The prospect for apples at time of last report were very flattering, but the heavy rains and hot sun, shortly after blossoming, caused a blight to fall upon the trees which almost destroyed the entire crop, and in many instances seriously injured the trees. Fortunately for us, the peach, quince, and grape crops were abundant. There has been considerable disease among the hogs in this section, which was wide-spread, many farmers having lost almost their entire stock. The disease seemed difficult to subdue, as it acted differently in very many cases. It was most fatal among pigs and shoats, yet many fattening hogs died with it. A few complaints are heard of disease among poultry, but I think less than usual. There has been considerable advance made in the use of farm machinery among us during the past summer. A number of self-binding reapers were used, and the whistle of the steam thresher is frequently heard. The growing of sorghum, and its manufacture into syrup, has materially increased since last year, and bids fair to be an important industry.

COLUMBIA, S. W.—There is no prevailing disease among our stock in this section, save chicken cholera. Is there no remedy for it? There is a great scarcity of fat cattle. Sheep-raising is almost entirely ignored. As a general thing, our *farmers* hate sheep and love dogs; while our *dogs* like sheep, and can worry them to perfection. Can not our sheep be protected? A cold east storm fixed our apple and pear crop in this section, when the trees were in bloom. A dry spell of two weeks, just at earing time, cut our corn below the average, but left it far better than last year, while the fodder is generally good. Pear blight affects our pear trees considerably. Fertilizers have been very largely used this year, and quite a *revival* of agriculture may be noted. Manure is more generally used on top of the soil here than formerly. The example of a "fool"—so-called ten years ago—is being followed. "Experience is experience." Potatoes are rotting to some extent. We hope for the best.

COLUMBIA, W.—The weather has been unusually favorable for late-maturing crops, the first frost to damage vegetation occurring on the night of the 20th instant. Clover in wheat stubble is exceedingly fine. Growing wheat is apparently doing well. The Hessian fly appears to be doing very little, if any, damage. I find in my own field, and in others that I have examined, an occasional stalk of wheat, and in very few instances several stalks together, dead. On taking hold of the top, they readily come up, and are found to be eaten off just above the grain. I have been unable, so far, to find the depredator. This appearance in our wheat fields has started the cry of fly among those who do not look below the surface. The plentiful appearance of a small beetle, working in fresh droppings of horses and cattle, and, I believe, always present in the warm days of autumn, and by some mistaken for Hessian, is a fruitful cause of unfounded alarm.

COLUMBIA, N. E.—With the exception of a few weeks' dry weather, which injured the corn some, we have had a fine growing season and an exceptional fall; up to the present, scarcely a pumpkin leaf has been touched with frost. The late planted corn has had a fine chance to mature, and the grass and sowed grain never looked finer at this season. There is some complaint of potatoes rotting, but I think the danger is not great. Apples in some particular localities are plenty, but in others an entire failure; even blossoming in the new of the moon did not save them. Chestnuts are abundant, and are selling at four cents a quart, and dull at that. Buckwheat will be tolerably plenty.

COLUMBIA, C.—Clover in stubble fields very good, never better. Seeding about ten days or two weeks earlier than last year. Ground was in excellent order. Wheat and rye came up nicely. Have had no rain for nearly three weeks. Grain not looking quite so well at present writing. Corn was injured fully twenty-five per cent. by being blown down in September by a hard rain and wind storm that passed over this section. No disease among poultry.

CRAWFORD, E.—At your request, I append a few remarks in relation to the report I have filled out. Wheat is a bountiful crop in this section this year, and was very generally saved in good condition, there being fair weather for the harvest. Hay is a large crop, also, but is not so well saved as last year, on account of a rainy season. Much of the hay was over-ripe before it could be secured. Corn is much better than the most sanguine expected in August, the frosts having delayed execution so long. Potatoes are an excellent crop, but the rot may make prices high before spring. Fruits of all kinds, except pears, plums, and berries, are nearly or quite failures. Take it all in all, the farmer in this section has but little cause to complain. Prices are good. Cattle scarce and high. Calves are bringing from ten to fifteen dollars. Pastures are immense, and stock is looking well. The farmers are learning to appreciate the work of the State Board, and they would much more if the reports could be better circulated.

CRAWFORD, N. E.—The apple crop is almost an entire failure in this locality; the apparent cause was a warm March that so far developed the buds that they were killed by the severe and unusual cold weather late in April. The same reason is connected with the failure of the peach crop. Your correspondent has one thousand peach trees that gave every appearance of a bountiful crop until after the cold weather in April, when the buds began to drop, and there was only a few blossoms and no fruit. We continued to have warm rain, and pasture was never in better condition at this season of the year. Late Rose potatoes rotted very badly. We have had a *very* wet summer. Some corn fields suffered from wire worms, but where super-phosphate was used the wire worm did not do any harm, and the corn crop was greatly benefited.

CRAWFORD, E.—The weather usually fine. The last three or four nights have given us the first killing frosts of the season, a full month later than the average season. The unprecedent change in the weather, directly after our last report, (May 15,) changed the appearance of the whole face of nature. The wheat crop which, at that time looked unpromising, has turned out, if my memory serves me rightly, the best we have had in thirty years. But the cool, wet weather of early summer, so beneficial to the wheat and grass, destroyed our fruit and gave the corn a hard run for its life, from which it only recovered by the unusually fine weather this fall. The weather during the whole summer has caused one continual unchecked growth of vegetation. Potatoes a good crop, nearly all small. Chickens died, and in consequence poultry is a failure this year. Other live stock healthy.

DAUPHIN, N.—Weather has been usually favorable for fall seeding, and the ground was in the best possible condition. Wheat grew well until early part of October, when it was attacked by a species of louse, which, if not checked, bids fair to destroy much of the early sown wheat in the Lykens valley. Stock of all kinds in good condition, and no unusual disease nor any disease prevailing to an unusual extent. Fruit crop a failure.

ELK, S. W.—Weather has been cool, and during the spring and early summer very wet, injuring all kinds of crops except wheat and rye, but a remarkably genial fall has ripened the corn, bringing it up to near a full crop. Apples a failure.

FAYETTE.—Wheat and rye never looked better, but owing to the lateness of the corn crop, the acreage will be, say five per cent. less than last year. Our corn crop is a fair average crop. Grass is very fine, and stock is doing exceedingly well. Potatoes are yielding, say middling well; the acreage being unusually large, the crop is much more than an average one; they are worth fifty cents per bushel. As to fruit, there was but little of any kind except wild, such as blackberries and elderberries. The late freeze in the spring killed everything in the fruit line except grapes, and of the latter there was but a slim crop owing to rot, caused by the general grape enemy, viz: the poloxera. Cattle have done well, and there is no disease among them in our county; the number is about average. Hogs are not plenty, but have been healthy and are doing very well. Horses are very much sought after, and are in consequence scarce and high. Sheep have done well and are bringing fair prices. Our county is more of a mining than a sheep county. Mining and dogs go together, hence sheep have given place to the worthless dogs. Wheat is yielding well, and is of excellent quality. Oats is generally light in weight. Rye is not much raised. As to buckwheat, our mountain reporters will have to report that crop. Our locust timber is nearly all being killed by the borer, and very many apple orchards are suffering in the same way; in fact there seems to be an insect to contend with in almost everything that grows. If your entomologist can name and destroy them, he will accomplish a great good. Insectivorous birds are pretty well exterminated by recklessness upon the part of men and boys. They shoot and kill birds purely for sport, and insects multiply accordingly.

FAYETTE, S. E.—The potato crop is not a good one, most of the large ones rotted. But for the rot, the yield this year would have been very abundant. The potato bug did not do much harm to the crop. There was not much difference, if any, between early and late sown wheat, as that which was sown early did not come up in a healthy condition owing to the continued dry weather after it was sown. A considerable portion was injured by rust, and a good deal of the grain did not mature well, and some of it was consequently shriveled. The oats crop might be considered a failure, owing to rust. As poor a crop has not been produced in this part of the country for a long time. The corn crop was late in maturing. The weather has been usually favorable, as there has not yet been any to do any harm. More corn than usual will be fed to horses, as it will have to supply the place of oats in a great measure. The pastures are excellent, and consequently stock of all kinds is looking well.

FRANKLIN, S. E.—The past summer has blessed our farmers with good crops. We, on this side of the county, had, on 28th May, hail, covering a belt of three miles wide, that injured our wheat about twenty per cent., rye forty—few fields were a total loss. What fruit was left from cold preceding, was entirely knocked off. Our clover of this spring's seeding is the finest for number of years. Much of it came into bloom, and so rank in growth, that farmers could not pasture it, for fear of losing their cattle—many did lose by bloating—this side of the county lost forty to fifty head. Potato crop was abundant. Most of the potatoes that were made after the drouth in August, are disposed to rot, and many are lost. The fall has been favorable for seeding, and wheat fields are sodded over, and well set to go into winter quarters. Oats poor in yield and quality. Corn a good crop, and frequent rains, with mild weather, has kept fodder green; corn damp, heavy, and not fit for cribbing in large amounts.

FRANKLIN, W.—Our wheat crop is the best we have had for years. The wheat put in this fall has been sowed later than last year, partly on account of unfavorable weather for sowing, but chiefly because the early sowing of one or two years past, was injured by the fly. Much of the oats was got up in bad condition. Of potatoes, fully forty per cent. are already rotted; mostly a black rot, but some places a soft rot and white, and some of them when broken open are filled with worms about half an inch long. Have never noticed anything like them before in potatoes.

GREENE, E.—A large acreage of oats was planted the past spring, but the crop fell below the average, both in quantity and quality, owing to the rust, and the inferior quality of the crop, particularly that portion grown in low lands, is already beginning to show itself in the thin condition of the horses.

HUNTINGDON, S.—The wheat crop was unusually heavy in straw, but generally filled well and plump grain, and made a fair average yield, and crop is very considerable above an average in yield. Weather in spring continued wet and cold, and corn was almost a month late in planting, and was very backward until the August rains and warm weather set in, since which time we have had the most desirable growing weather, and up to the present no frost, and corn is now well matured and being cut up, and promising a fair crop. Last spring's sowing of clover is one of the best catches known for many years. Fruit, a general failure, owing to late frosts. No disease among stock, but the potato crop is likely to be lost with soft and dry rot, particularly those left in the ground until late. Acreage of grain sown this fall will fall below an average, owing to the continued wet weather.

INDIANA, N.—There has never been a more productive yield of wheat, corn, oats, rye, potatoes, in fact all grasses, hay, and pastures as have been this year. Gardens never better in North Central, Indiana county. Almost a total failure of apples. A partial failure of cherries. A very abundant crop of grapes. In certain sections a pretty fair crop of peaches. The difference in fruit yield may be attributed to the cold frosty spring at blooming time. Orchards shielded from the north-west winds by timber or hilly ground gave a pretty fair yield. Horses, cows, fat cattle, swine, sheep, and poultry in good demand, and prices fair to good. No prevailing disease in stock of any kind, except some flocks of sheep have been pretty well thinned out, said by some to be scab. The opinion of your reporter is that the last winter being open and wet, and the spring being cold, and this season all through being very wet, may have something to do with the diseased condition of the sheep.

INDIANA, S.—The wheat, rye, oat, and grass crops in this section were quite satisfactory. The corn crop will prove small, owing to unfavorable season, too cool during the growing months—June, July, and August. The later more favorable weather and absence of frost to date, (October 10,) will aid greatly in hardening the large percentage of small ears. The fall has been very favorable for growth of pasture and sown grain. The fall pasture is most abundant, and live stock in fine condition, though scarce and high. Horses and hogs command higher prices than any time since 1867. Good, fat cattle, five cents per pound. Fat sheep, four to four and a half cents per pound. Hogs, seven to eight cents. Heavy draft horses, $200 to $300.

JEFFERSON, S.—In some sections the rose-bug has injured the grape crop. Potatoes rotting rapidly. Some "pink eye" among horses. The high price of feed last fall caused farmers to sell their pigs off close, and they are now scarce, and worth seven cents a pound. Weather unusually wet for the past eleven months.

JEFFERSON, N. E.—Oats badly rusted. Potato crop up to that of last year, and rotting badly. Apples nearly a total failure. The fall in the price of wheat, with the fact that farm teams command good wages on the new railroad, have caused a diminished acreage in fall grain.

JUNIATA, C.—Hog cholera has prevailed in some sections to an alarming extent, causing the loss of, perhaps, one fifth of the swine. Some appeared to have something like pnuemonia and other diseases.

LANCASTER, N. E.—The corn crop is good in fodder, but about three quarters of a full crop of ears will be the yield of the eastern part of Lancaster county. The corn was well started, but, on account of the dry weather in July and August, the ears did not fill out fully. The wheat crop was an extra one in straw and grain, both in quantity and quality, and, I think, was the largest crop per acre ever raised in this county, some acres yielding between forty and fifty bushels per acre, and the average being about thirty bushels per acre. The Goodville and old Mediterranean varieties gave the best yields. The oat crop was short in straw compared with last year, and was a light crop in weight and in bushels per acre. Rye is not much cultivated in this county. Farmers now use tarred rope to bind corn-fodder, and very little of this crop is raised. Late planted potatoes yielded well, but the early potatoes were not a full crop. The apple crop promised to be an abundant one, but was a small yield. The apples fell from the trees before they were ripe, and were very imperfect. Considerable cider was made, but few apples could be kept for winter use. The tobacco crop has been one of the best raised in this county for several years, but some of the late tobacco, which promised to be the largest and best, was destroyed and injured by hail storms. The crop is curing very finely, and will be a very desirable one for the buyers, but prices will be lower than last year. I raised six acres of tobacco on an old meadow that had not been plowed for thirty-eight years, which was the largest growth of plants ever raised in this section. It was topped to twelve to sixteen leaves, and there were few leaves, when cut, that measured less than thirty inches long, while many were forty-three by thirty inches. I had one stalk that weighed eleven and a quarter pounds when cut, and one leaf that weighed three quarters of a pound. This crop is of the Glessner variety, and, I think, will yield over one ton of cured tobacco per acre, and as fine a quality of leaf as any grown in the county this year. The tobocco of this county was topped lower, and will be more uniform in the leaf, and have fewer small leaves than any raised in the county before this, and more attention is given to the curing and handling of the crop than formerly.

LANCASTER, S.—In this section of our county, we have had frequent rains. Wheat has pushed forward rapidly, and that sown in the early part of September is unusually large for this season of the year. Pasture also, for the same reason, is abundant, and will furnish food for stock to a much later date than usual. Much of the tobacco in this region has been entirely destroyed by hail. High winds have also injured it to a greater or less extent, so that there are very few whose crops of this article could be called strictly first-class. Oats this year was a very promising crop, indeed, until shortly before harvest, when the heads began to develop, showing fully one fourth of them to be black and smutty—plenty of straw, and grain light.

LACKAWANNA, N.—The present season has been a remarkable one, on account of the extremes in the weather, the early spring being wet and cold, and the fall warm and dry. The first frost to injure tender plants was on the morning of the 21st instant. This indicated ten degrees below freezing. Many crops that were greatly injured by cold and wet in spring had ample time to mature a more than average yield in many instances. The Colorado potato beetle that came in such countless numbers early in spring, and threatened to be so destructive, has done very little damage in consequence of the early wet and cold weather and the little fly that destroys the eggs after they are deposited upon the leaves, and we find very few of the larva left, and hopes are entertained that we may escape further damage from this pest. The codling-moth has been unusually plentiful and destructive; and unless its ravages are checked, apple growing will be unprofitable. In many orchards, the crop is damaged fully one half the present year. When orchards are pastured by sheep and swine through the whole season, they are not so abundant; but unless a whole neighborhood unites, this remedy is not effectual, and the lone trees that are permitted to grow in the fields are a prolific source of supply of this insect. The cabbage-worm has also been very plenty and troublesome. A weak solution of saltpeter has been useful in destroying this worm; also, salt and water has the same effect. The pea and bean weevil are also rapidly increasing, and these crops are rendered worthless, unless used in the green state; but if those that are saved for seed are immersed for a moment in boiling water, the eggs are destroyed effectually, and the seed is not injured; and those for the table might be treated the same way. Concert of action in a neighborhood might rid it of this pest. The fruit-tree borer is also making sad havoc in young orchards. Wrapping the trees loosely with tarred paper seems to be the most available remedy. The farm stock in this vicinity is remarkably free from disease, and in fine condition. Crops are in the main good, and prices remunerative. and in many cases yielding large profits, so that farmers are thriving generally.

LAWRENCE, S.—The cold wet spring rotted the corn and kept it back, until, at the middle of July, the outlook was unfavorable for a half crop; but August and September came in place of June and July, and gave us boiling corn to the middle of September. And now, October 19, finds our corn not all cut and as green as August, without any frost, and the pasture growing. The wheat is growing very nicely, yet some fields are injured with the fly, and some are hurt with a worm or bug at the root; the insect is about the size, shape, and color of a grain of wheat.

LEBANON, C.—The low averages of the apple and pear crops are probably owing to constant rain during the period of blossoming. The promise of abundant fruit was unusually fair—the orchard blooming profusely, and this being also the apple year. Growing interest in fruit culture is manifesting itself. Many new orchards of choice fruit are replacing the old and poor varieties. Better prices and increasing demand making fruit raising highly profitable. The oats is from four to eight pounds under weight, attributable to drought when filling.

LEHIGH, N. W.—The cherry crop was nearly a total failure owing to the cold and rainy weather in blossoming. I have noticed for a long time that cherries are very sensitive in blossom time; if the weather is wet they will not fructify, as the dust in the blossoms must freely circulate through the head of the tree to insure a good crop. The cause of the failure of the apple crop is not so easily given. as they had splendid weather in blossom time, and we hoped to have a full crop, but the trees were affected with a species of blight soon after blossoming, as also with a late caterpillar which did great injury to trees, devouring, in some cases, all the leaves. The trees present at this time a wintery appearance. The horses and mules in this section are entirely free from any contagious diseases. We had some pink-eye in the spring, but it has all disappeared. The cattle, generally, are very healthy and in good condition. The pasture during the summer was free from mildew, and there was no slobbering of horses as is the case nearly every other year. The potatoes, with some farmers, would not sprout, but rotted in the ground and did not come up. In ordinary years we raised about four hundred thousand bushels in the townships of Lynn, Weisenburg, Heidelberg, Lowhill, and Washington. Some single farmers raise as much as twenty-five hundred bushels. The young clover in the stubble field, as well as the young timothy, looks better at this time than it did in the last ten years.

MERCER, W.—The fore part of the season, until clover harvest, was very wet. On flat lands it was very difficult to get corn planted, and equally so to get it worked. Wet weather and cool season made our corn nearly three weeks late. On rolling and gravelly lands the corn is very good; on flat clay lands, just as poor. The favorable fall weather helped to mature it; still, a large part of our corn is not fully matured. Potatoes suffered from the wet weather, and on low lands were wholly, or in part, drowned out. The tops were struck with a blight, causing them to die three weeks too soon. The rot affected them in a certain degree. These causes bring the crop below the general average. The wet weather drowned oats out in flat lands. Rust ripened them too soon, and, consequently, are about two pounds too light in weight. The dry weather of 1881 partly killed the sod, so as to cause apprehension for the crop of 1882. The wet and cool fore part of the season caused it to gather up amazingly, and gave us more than an average crop, and, on newly sown fields last spring, I never saw a better stand. The whole season has been favorable, so as to leave our grass crops of all kinds in good condition. Favorable weather gave opportunity to get the wheat crop in in good condition. Some farmers apprehend too much growth. The good condition of our pasturage leaves our cattle, at present, in good condition. Beef sells, by our butchers, from eight to sixteen cents per pound. Beef on foot, grass fed, $4 75 per hundred.

MERCER, C.—The fly injured the wheat in our section, shortly after it had been rowed last fall, to some extent. Apples are a failure this season in our part of county; late frost was the cause. Peaches a good crop. Berries were a good crop. Grapes not more than half a crop. The grain sowed this fall looks well. Pasture good. No disease among the stock in this part of the county.

MERCER, S. E.—Wheat and hay crops above the average. Oats badly down; wasted in the cutting. Corn will be much better than was expected. No frost until the 20th instant. If frost had come much earlier, there would have been little good corn. Apples bloomed in the cold, made a sickly start, fell off from the first; now there are but few. Strawberries and raspberries good. A noticeable miss in our wild fruits is the failure of the wild crab-apple; but few to be found.

MIFFLIN, C.—Oats were struck with rust, some weeks before cutting time The blades being the lungs of the plant, result is, oats are poor quality being very light. Corn decidedly better, favorable rains making the difference. Hay very good; rains in May and June. Potatoes yield very good. Fine, growing rains. In some localities, people complain of rot. Clover and timothy, on stubble ground, very good; never was a nicer growth of clover, both on stubble and two-year-old clover. Acreage on wheat crop, 1882–3, a little more than last year. Late sowing, this season, prevents me from making satisfactory report, but wheat thus far looks very well.

MONTGOMERY, S. W.—The wheat crop has, in threshing, turned out above all expectation. In some cases, nearly fifty bushels per acre; in one field said to be fifty-four and one quarter bushels per acre. In many crops above forty bushels per acre. The drought told against the corn during the summer growth, but the September rains helped the earing, so that the crop is better than the August or September promise. Some fields, that were late planted, will make a fair average crop. On high, dry hill-sides, the crop is light; in a number of such fields will not be more than half a fair average crop. Potatoes vary in the same way, under similar circumstances. The fall pastures are better than usual—a good bite for cattle now. Many of the farms are mainly used for dairying. Some of the farmers retail their milk from their wagons in Philadelphia, who realize eight (8) cents per quart in summer, and eight to ten cents in winter. Others sell to the retailers at the farm, or send by railroad to the city. Others make butter, and sell it in Philadelphia, some of which butter ranks as best gilt-edged; some otherwise. No creameries in this township. Most of the farmers not only feed all the corn, oats, &c., that they raise, but, in addition, buy large amounts of corn-meal, bran, brewers' grains, malt-dust, &c., in many cases to twice or three times the amount of feed their farms produce. We have no cattle-feeders, (so-called,) the fat cattle sold, are, as a rule, the dairy stock, that fail for any reason not to be up to the mark for milking purposes. The greatest trouble with farmers now, is the want of good and efficient farm hands.

NORTHAMPTON, W.—Wheat, rye, and hay were good. Oats light. Corn and potatoes only about half a crop, on account of the late, cold, and wet spring, and the drought began on the 13th of July, and lasted until the 27th of August. All the rain that fell between these dates would not have prevented a man from harrowing at any time, and even these showers were not nnmerous. All fruit and garden products were kept back by the long-continued drought in this section, caused the fruit crop to wilt and fall off, especially the early varieties. But since we have rain, everything begins to grow, and look nice and green. Copious showers at sowing time, and warm fall weather to the present time, nearly everything looks green yet. We had no frost yet, up to October 17. The present fall sowing of wheat and rye, and the clover in the stubble never looked better than at this season of the year.

NORTHUMBERLAND, C.—The marked difference in the crops of 1881 and 1882, you, no doubt, find prevails throughout the State. Our pastures last year at this time were almost entirely dried up. This year, the fields present a beautiful appearance, there being a considerable amount of rain, but not an excess. The fruit crop this year is again almost a failure, as regards apples. They blossomed out well in the spring, but froze during the cold nights at that season of the year. The ground freezing after the fruit had set on the trees, also causing the leaves to wrinkle and look as though attacked by some insect. During the latter part of the season, they improved very much in appearance. There is now prevailing, in the town of Sunbury and vicinity, a disease among the cows, supposed to be contagious, and to have been brought here by Western cattle, although this may not be the case. The cows first break off in the yield of milk, and after a couple of days' sickness die. About twenty-five have died here within the last two weeks.

Potter, N. E.—About the 10th September there was a sort of rust struck the potatoes in this section, which turned the tops dark brown, the leaves withered, and the tops mostly died. Have never noticed such a thing before. The leaves looked as though they had been eaten off by some insect. There is some rot reported, but nothing serious. Grain is about a fair yield. Berries were very plenty this year; more so than for several seasons. Apples along the Genessee river are a poor crop.

Pike.—Our potato crop from some cause was very poor, and very many of them badly eaten by worms. I should say about half a crop. Buckwheat crop, owing to the drought in the late summer, was but very little above a half crop. The hay crop in this locality very abundant. Wheat remarkably good. The apple crop poor. Peaches the same. Grapes very abundant, and quality good. No disease among live stock so far as known. A considerable amount of new ground has been broken up, and sown to rye; and there seems to be more interest felt in agricultural matters in this county than ever before. The price of uncultivated lands is advancing, and the outlook for agricultural interests are much brighter; and as the lumber disappears, farms begin to show in many localities formerly covered with dense forests of hemlock.

Snyder, S. E.—The hog cholera had made its appearance in our county, with fatal results. Some farmers lost nearly all their stock, but it is on the decrease. All other stock is looking well, and no disease to report, except among chickens, which have been dying off very fast. Some farmers lost all their flock. Wheat, rye, corn, buckwheat, and potatoes have been average good crops; while oats and tobacco have not been more than half a crop, and very inferior. Clover seed and apples are almost a total failure. The winter grain was sown the latter part of last month, and is looking very fine, and, with the favorable weather we have had up to this writing, (October 17.) will have sufficient growth to withstand a severe winter. The grass fields are looking exceedingly fine, with a heavy growth of grass upon them.

Somerset, S.—The shortness of the crop of wheat, comparing with appearances of early spring, is attributed to wheat being sown too early last season. It produced an abundance of straw, but early sown wheat turned out small in the grain, hence production was not as great as anticipated. Oats started remarkably well, but season being wet and cold in early summer, something like rust affected it, giving it a sickly appearance, causing it to prove light, especially the late sown, much of it weighing only about twenty-two pounds to the bushel. Corn has done well. It was feared the continuous cold weather would shorten the crop, but having escaped any injurious frosts, and the past ten days being warm and dry, it has matured well; has been cut and shocked, promising the best yield we have had for years. Live stock has had an abundance of fine pasture, and now, October 9, our fields are covered with abundance of both native and artificial grasses. A large crop of second crop has been secured by our farmers for fall and winter feeding, giving abundant food for dairy production. Fruit, with the exception of grapes and berries, were almost an entire failure. We think the blossoms were injured by extreme wet and cold weather. I fear our farmers have again sown their wheat too early, although some ten to fifteen days later than last year.

Somerset, C.—The yield of wheat runs from twelve to twenty-five bushels per acre—some cases higher, twenty-seven. Rye also turns out well. Oats, an abundance of straw and a good stand, but owing to rust or a small insect about the time it was filling, caused it to be light, weighing from twenty-four to thirty pounds. Corn is a splendid crop. Pasture is unusually good, no frosts until the 19th, and that did no harm, hardly killing the pumpkin vines. Apples, in some sections, are a complete failure, in others a fair crop, but on the whole less than half crop. Horses and cattle are in fine order, bringing big prices. Same of sheep. Wheat is rather dull sale, buyers don't want to pay over one dollar. Rye is mostly bought up by the distillers.

SULLIVAN, C.—The warm weather of September, and the freedom from frosts, only in some low localities, have produced almost an average crop of corn. Peppers and tomatoes are fresh and green at this writing, October 16. Potatoes give the best yield in quality and quantity for many years. Some complain of rot. It is, however, only doing little damage. Apples, at the commencement of the season, promised well, but high winds, severe storms, and worms have left us but a small crop, and generally poor in quality. All kinds of stock are in fine condition, and find ready purchasers at high prices. In this section the drought has affected us but little.

UNION.—The wheat crop last fall came up more irregularly than any season I ever remember of seeing, but the spring and summer being favorable, the crop was a good average. The wheat and rye this fall came up quicker and better than it has for several years—at present looks beautiful. Corn came up well last spring, and the fodder is equal to any season during the last five years, but the dry weather in July and August injured it very much, especially the early planting; some that was planted late has much better ears on but the corn is very soft, but if the present weather continues a short time it will dry sufficiently to crib, without danger of spoiling. Potatoes are very fine, the crop is not as large as I have seen, but the quality is unsurpassed by any former season for some time past. Apples are of a very poor quality. Peaches in abundance, but the quality is not as good as I have seen. Late peaches were the best in quality this season.

UNION, E.—Likely there has never been more complete contrasts in the controlling conditions of any crop than is shown in comparing the wheat interests and prospects of the present autumn with the same of 1881. One year ago, during the seeding season, from the last week of August to the last week of September, the then prevailing serious drought not only prevented wheat seeding, but nearly destroyed all delicately constituted vegetation. This fall, through these same corresponding weeks, a first-class condition of moisture abounded; and they who were fortunate enough to be ready, and improved the earliest opportunities of prime conditions of soil, and used best phosphates, are to be envied by those who, by neglect, choice, or from any other cause, failed to secure this vitally important advantage. The earliest planted was treated to a covering of one and one inches snow-fall before coming up, and, where the soil was not too wet, came well and matured finely. The rains and quite low temperature of July and August developed a vegetable growth, which set the ears, on an average, full one and a half or two feet higher from the ground than the most observing have ever before seen them, and, as a result, three fifths of the entire acreage stood too thick, and the late planted is too immature. The rain storms of the last of August and first of September came upon this tender, tall, and top-heavy growth, and it toppled over, to the right and left, back and forward, so as that to cut and shock the crop costs, per acre, one hundred or one hundred and twenty-five per cent. more than in

1881. It is safe to say, from four to nine per cent. of our whole crop will be too soft to make merchantable grains, and will grade low, because of the ripening season having set in too late. The potato crop last year came from the field worth one dollar per bushel in our home market, and none in car load lots were moving. Of 1881, at harvest time, only one special time's planting was found to be a success. This fall, we send abroad on cars, at forty and forty-five cents per bushel, thousand of bushels, and almost all conditions of planting and culture yield remumeratively. If there is an exception, it is in the case of planting the "longest day," which rule came from our grandfathers, and has, of late years, so often failed that it has become almost obsolete. The crop of the "longest day," at its setting and too large a proportion of its growing, had too many very short rain-falls, followed by excessive heat, and is found to be decaying, in so much as not to be a decided success or a complete failure. Early planting, therefore, proves best. The very perishable condition of the late crop almost forces it out of the market. The imperfect condition of all fruit, and the watery, wood-flavored quality of the peach, must be regarded as the product of two elements, very opposite in their nature—"fire and water." If its decay is attributable to any climatic causes, too much rain and too much of the August sun caught the crop, and the one closely following the other. But it is not to be regarded with a spirit of complaint that the reporter notes these items of fact, for many farms were comfortably, and some extremely well, supplied, and will thankfully remember the peach crop of 1882. The apples seem entirely gone from very old trees, and when harvest time comes, only the trees of youthful tendencies can be relied upon for winter family use. Our cellars in mid-winter will contain but a very limited amount of green fruit. All "winter apples," so called, seem to be softening, and hardly as solid and crisp as good "fall fruit" sometimes is when gathered for the cellar. Much of this crop will not be gathered. Labor scarce for the farm and work behind, and is too expensive to be profitably employed in making cider. Therefore, in many orchards, loads decay of that kind of apples, which, if taken timely, would otherwise be utilized. Pears and grapes are even yet a perpetual delight to the children, and for the family very acceptable. The grapes plated out to callers add to our hospitality, and friends enjoy the savory bite; and occasionally, as table adornments, "fill the bill" handsomely. The Delaware and Iona come to us this time sound, and with an exceptionally fine flavor.

VENANGO, S. W.—I have to change my estimate report made last May. The cool, wet weather of May and June was favorable for the restoration of the wheat and grass crop, and when harvest came, we had a good average. The summer was wet and cold, and all crops three weeks later than usual, until the 1st of September we despaired getting a crop of sound corn, but now, October 14, the corn is all cut and ready to husk, and we have a good average crop. Buckwheat is grown here to a considerable extent, and we have the best crop we have had for five years. Apples are a failure, the few there are, are small and defective. Oats were heavy in straw, but light in the grain. Bees did not swarm as usual, but laid up a good store of honey. Cattle and sheep are healthy and in good condition, there being an abundance of green feed and no frost to kill the tenderest plant. Cabbages are the largest in size I ever saw, and all vegetables are abundant. The season was too wet for potatoes; the yield was better than last year, (and more planted,) but at least one quarter are lost by the rot.

VENANGO, N.—When I last reported, the prospects were gloomy; rain and frost had been the order of the season. But everything has changed for the better, and we have abundant crops of hay, oats, wheat, and a tolerable crop of corn. Potatoes rotted badly, and are not more than two thirds crop. I notice the Burbank seedling is almost the only variety that stood the rot. Apples, peaches, and plums were set very full, but the 1st of June there was a cold north wind prevailed for several days, with what I called an air night freeze, no real frost, that destroyed all our fruit, so we have little to report. Fall wheat looks fine. Most farmers used the drill this fall in seeding wheat; a new departure here. Meadows, pastures, new seeded lands, look fine. Have had no dry weather here to stop the growth of vegetation this summer. No diseases among cattle, except a few cases of black-leg among the calves. Sheep are fine, healthy, and fat. Fat cattle scarce and high, worth in Titusville four and one half cents per pound gross. Good horses for road or harness bring from $150 to $300. Farmers waking up here, buying seed drills, reapers, manure spreaders, pulverizers, plows of best quality.

WARREN, N. W.—You will observe that our fruit, the present season, is almost an entire failure, except berries. The cause is hard to determine. The estimated cause, I think, but it is only a theory, is that the extreme drought of last summer and fall, or the summer and fall of 1881, was a hard draft on the stamina and vitality of our fruit trees, so that many of them did not blossom at all, and those that did, and the fruit set tolerably full, yet so much was the natural health of the tree weakened, that the fruit after being formed nearly the size of filberts, failed for want of proper nourishment and fell to the ground, caused by the enfeebled condition of the tree from the last year's injury from drought, and the cold, unfavorable weather in the spring and early summer retarding the necessary circulation, the two causes combined being too much for the vitality of the tree to overcome. No special disease of animals, but on the contrary very healthy in general. A few cases of death of calves in the extreme north-west of the county, by some thought to be the "black-leg." The potato-bug and the rot have affected us some in this section. Our corn was backward in ripening in consequence of cool, unfavorable weather in the summer, but the fall has been unusually favorable, having had summer weather most of September and October. Plenty of rain. Pasture good, and beautiful weather at present.

WARREN, C.—The spring was very cold, wet, and backward in this section. Corn was planted late. It continued wet and cold, making, as was thought, a failure of the corn crop, but the weather finally changed, and had some very fine weather for corn, which made a great change in a short time, although it ripens very slow, will probably be two thirds of a crop. Potatoes were a very promising crop until a blight seemed to strike them, which caused them to rot very bad. In some localities more than one half rotted, making the potato crop very light. It was thought, early in the season, that potatoes would be very cheap this fall and winter, but it is past that here. Apples are very scarce; good winter fruit is selling for one dollar per bushel now. Wheat has been an extra crop. Our last winter proved a very good one for wheat. Oats rather light, but a little better than last year. Rye a little better than last year—not much of it raised in this section.

WASHINGTON, N. W.—The fruit crop in this section, if we except berries, was almost a total failure. The oats crop was badly rusted, except on high ground; on low ground, or if a valley happened to be in the field, they were not more than half a crop; they would not weigh more than twenty pounds to the bushel. The old sods in this section are almost worthless for pasture, on account of the grub-worms—they have the sod all loose—nothing but clover or weeds will stand dry weather; this is especially the case in sandy soils. This injured the corn very much during the dry weather in June and July. We would like to know what to do with this pest, have a mind to try salt. Will some member of the Board inform us how much to use, and how to apply? Many of us used the drill in planting our corn this year, and are very much pleased with the result. We are satisfied that we can raise more corn than by the old method of planting in hills. One farmer used the drill on all of a field except eight rows in the middle of it. He informs me that the drilled corn has kept ahead of it all season, and he thinks will make from twenty-five to thirty-five per cent. more corn. No more hand-planting for him. Stock is generally healthy, no prevailing disease, if we except the hogs. One of our neighbors lost ten head, and another all he had, from cholera.

WASHINGTON, N. W.—Fruit crop almost an entire failure; frosts from April 9 to May 3, with the east wind did the damage, and destroyed all fruit crops except grapes and berries. Time of blooming of trees: Peach, April 5; cherry, April 7; apple, May 4; dogwood, May 11; quince, May 14.

WASHINGTON, N. E.—Crops with us, with the exception of oats and fruit, have been fine. Oats suffered from too much moisture, causing them to rust, while the straw was large, the grain was deficient in both quantity and quality. Fruit was a failure, for the reason that the mild winter caused the buds to swell prematurely, and the cold and frosts of the late spring killed the blossom. What apples did mature are injured, being knotty and imperfect in flavor as well as form. The season has been a remarkably wet one throughout.

WAYNE, C.—Potatoes would yield much more than last year, were it not for the rot; some fields are forty per cent. rotten now, others scarcely any. I think the rot will reduce the yield in this section of Wayne county, to fifteen per cent. Corn is not well eared, not well filled. No frost at this date, October 11, to damage growing crops in this section of the county.

WAYNE, N. E.—Weather warm and dry. Thermometer about eighty degrees in shade and one hundred and eight to one hundred and ten in the sun. Farmers busy gathering crops. Work is going on brisk. The summer has been a very changeable one and probably will last well into the autumn of this year. Hay crop No. 1, and stored in good condition. Wheat crop the best it has been in years, far above the average. Rye No. 1. Oats only average. Potatoes only fair. Will be high in the spring. Apple crop only medium. Trees blossomed very full in the spring and set full of apples, but the frost of June was too much for the young apple, and they dropped off prematurely. Apples are in good demand. Winter apples bring fifty cents per bushel in the orchard, or $1 50 per barrel at our railroad station with the barrel furnished. Thousands of barrels will be shipped out of this county. Farmers begin to see the value of good grafted fruit for it finds a ready market. No peaches. Pears not plenty. Grapes fair. Buckwheat only an average crop; is worth one dollar per bushel. Pork high, nine to ten cents per pound. Beef cattle not plenty. Fall pasture good.

WESTMORELAND, S.—The wheat crop in this section is more than usual average, would be about 110. Corn is better than last year, making about 110. The oats not as good as last year, making about 80 per cent. Hay is an average crop, 100. The fruit is an entire failure owing to the hard freezing in the spring. Stock of all kinds is ten per cent. better than last year in price.

WESTMORELAND.—The prospect for apples, pears, peaches, cherries, and plums were good up to the (about) 10th April, when a freeze with frost destroyed the crop in toto. The grapes suffered slightly. Blackberries abundant. Corn, bad show early—short with plenty of root—three fourths of field too heavily planted and not sufficiently thinned. The crop would have been above the average only for this. Planters were generally used. Wheat and oats yielding well. Wheat sown this fall remarkably promising. Early sowing (last August) to good laying down. Yellow at roots. Fall splendid. Rain sufficient. Generally clear. No frost until October 15, (slightly.) Did no damage. Corn ripening nicely. Pasture plenty and good.

WESTMORELAND, S.—The cold weather of April 11 and 12 froze all the fruit and accounts for the total failure of apples, cherries, peaches, &c., and now, October 10, I think I never saw this section of our country look so green. All vegetation looks much more like June than October. The present crop of wheat in the ground has an unusual fine start, with pasture very abundant and the weather warm and pleasant.

WESTMORELAND, C.—The threshing of wheat and oats crop of 1881 showed the errors of estimates placed on prospective yields, and placed the crop low. This year's threshing is progressing, showing satisfactory yields, particularly in wheat. The fine growing season has continued throughout the year in this section, and accounts for the large hay crop, and the magnificent condition of young grass in wheat stubble, and two-year old clover and timothy, and pastures. While the corn crop looks well, there will be considerable soft corn, thereby reducing the value of the crops. Owing to the low price of wool and sheep, that industry is neglected, the numbers and average condition being lower than some years since. Farm stock of all kinds being exceptionally healthy, this county raises a great many heavy draft horses, which sell for good prices, thereby raising the average on that class of stock. Fruit of all kinds, except berries and grapes, are an entire failure. Owing to the large development of the mining and coke manufacturing interests, our county is neglecting agriculture somewhat.

YORK, S. E.—One of the most noticeable features of the present season in this section has been the alarming increase of insect depredations, particularly the caterpillar tribe. The cobwebs of these pests can be seen in every direction, not only on the fruit trees, but also on those of the forest. Fortunately, the potato beetle gave us less trouble than it has since it made its first appearance, and one application of Paris green seemed to exterminate them. The lady-bug gave material aid by devouring the eggs. The caterpillars of various kinds were very distinctive in the vegetable gardens, but the *Pieris rapæ* was not so bad as last year; and I have as yet seen no appearance of the new cabbage worm, which was so destructive last year. Consequently, it will not be necessary to import our cabbage from Germany this year. There is every indication of a fine crop.

YORK, S. W.—The past season has been very favorable to farm crops. Grain rank in straw, and of good quality. Much corn was planted late, owing to heavy rains in spring, but frequent showers during July and August, and a late fall, brought out a fair crop. Apples were a failure with us. A few of the early varieties succeed well enough, but winter apples are scarce. There is hardly a farmer in our vicinity who can show a barrel of well-matured apples at this season. Pears and peaches were small, and, with few exceptions, of inferior quality. Winter grain has made a good start. Should the weather continue mild much longer, some fields might be pastured. Owing to our short corn crop last year, hogs are scarce and high in price. Steers plenty, but high in price. Pastures good. No disease of any kind to report.

ACREAGE OF CROPS—ACTUAL AND PROSPECTIVE—MAY, 1881.

COUNTIES.	COMPARED WITH LAST YEAR, AS 100.					COMPARED WITH AVERAGE OF PAST 5 YEARS, AS 100.				
	Wheat.	Rye.	Oats.	Corn.	Potatoes.	Wheat.	Rye.	Oats.	Corn.	Potatoes.
Adams,	104	102	92	100	100	107	100	90	100	100
Allegheny,	100	97	105	102	100	107	102	103	105	125
Armstrong,	103	104	94	100	100	102	102	100	100	105
Beaver,	110	102	100	100	107	105	105	102	107	105
Bedford,	105	102	105	102	100	110	105	103	105	100
Berks,	103	110	100	105	103	102	99	102	107	110
Blair,	107	102	92	110	110	110	110	90	109	100
Bradford,	102	100	97	102	107	101	101	100	102	107
Bucks,	100	105	90	100	105	100	100	92	100	102
Butler,	103	104	90	103	108	104	104	95	100	108
Cambria,	105	100	105	102	103	104	103	102	100	105
Cameron,	105	104	97	100	104	107	108	100	115	111
Carbon,	102	110	107	100	102	104	103	100	109	110
Centre,	98	100	90	90	100	100	100	90	93	100
Chester,	100	95	98	100	103	100	90	93	100	95
Clarion,	105	106	100	107	110	106	109	104	105	107
Clearfield,	98	103	91	95	102	100	100	93	102	108
Clinton,	106	102	100	97	105	105	100	100	102	106
Columbia,	100	100	100	104	100	105	98	100	102	103
Crawford,	103	102	100	100	104	100	100	100	102	105
Cumberland,	105	105	100	102	100	107	102	100	100	100
Dauphin,	100	100	95	102	104	100	100	92	102	107
Delaware,	103	100	95	105	104	105	100	92	106	108
Elk,	110	110	102	107	110	115	109	104	106	110
Erie,	100	100	95	104	115	100	100	95	104	117
Fayette,	105	92	87	100	107	110	107	100	102	104
Forest,	111	112	107	100	107	115	110	102	103	110
Franklin,	100	100	95	102	107	100	100	100	102	108
Fulton,	100	100	102	104	107	100	100	104	102	105
Greene,	100	100	95	103	105	100	100	98	102	107
Huntingdon,	105	106	102	104	107	110	115	107	110	112
Indiana,	102	101	100	103	102	100	100	95	104	106
Jefferson,	105	105	104	110	110	107	110	100	100	115
Juniata,	107	102	100	104	106	102	102	100	103	103
Lackawanna,	104	95	105	104	115	100	100	100	102	110
Lancaster,	105	103	100	105	107	102	102	106	103	102
Lawrence,	100	102	100	104	103	100	102	100	105	107
Lebanon,	102	100	100	100	101	100	100	100	102	100
Lehigh,	105	100	95	102	102	105	100	100	100	100
Luzerne,	103	107	92	107	111	102	102	95	103	105
Lycoming,	100	100	94	102	107	100	102	97	100	100
McKean,	110	110	97	110	115	107	107	100	109	110
Mercer,	106	105	100	107	105	103	103	100	103	102
Mifflin,	100	100	100	102	103	100	100	100	100	102
Monroe,	115	112	100	110	111	114	112	100	107	110
Montgomery,	105	100	100	110	100	110	90	95	110	100
Montour,	105	110	107	110	105	110	107	111	111	115
Northampton,	100	100	100	100	100	100	102	103	101	105
Northumberland,	100	95	95	102	103	100	96	96	102	103
Perry,	105	95	100	105	110	110	100	105	110	115
Philadelphia,	95	105	90	100	100	100	100	100	100	100
Pike,	95	94	92	100	104	95	97	100	100	103
Potter,	107	106	100	107	110	109	109	103	108	111
Schuylkill,	100	90	100	110	110	103	100	105	106	107
Snyder,	100	100	95	102	103	106	108	100	104	105
Somerset,	105	90	102	104	105	102	98	104	105	98
Sullivan,	110	105	108	107	104	115	108	113	115	114
Susquehanna,	102	95	95	100	105	100	90	98	100	105
Tioga,	100	100	100	102	103	100	100	97	102	104
Union,	100	100	97	102	103	100	100	97	100	102
Venango,	105	107	95	102	103	107	107	100	107	104
Warren,	103	95	100	105	102	110	100	105	110	105
Washington,	102	102	100	103	102	100	100	100	102	100
Wayne,	105	100	105	100	105	103	100	102	100	105
Westmoreland,	103	101	95	100	105	109	100	95	102	100
Wyoming,	105	100	95	102	105	104	107	100	110	100
York,	100	90	92	104	110	100	95	90	102	105

CONDITION OF THE CROPS, MAY, 1882.

[From the consolidated returns of 450 official reporters.]

COUNTIES.	COMPARED WITH SAME TIME LAST YEAR.								COMPARED WITH AVERAGE OF PAST TEN YEARS.							
	Wheat.	Rye.	Grass in wheat stubbles.	Clover in two year old fields.	Mixed grasses in mowing fields.	Timothy in mowing fields.	Pastures—natural grasses.	Pastures—artificial grasses.	Wheat.	Rye.	Grass in wheat stubbles.	Clover in two year old fields.	Mixed grasses in mowing fields.	Timothy in mowing fields.	Pastures—natural grasses.	Pastures—artificial grasses.
Adams,	97	100	100	92	97	99	100	100	95	100	90	90	93	95	98	97
Allegheny,	87	92	102	78	87	90	90	90	98	97	90	77	90	87	100	100
Armstrong,	100	100	100	97	98	92	97	97	98	100	90	94	90	98	100	100
Beaver,	103	102	93	97	95	95	95	97	107	107	90	95	97	97	92	93
Bedford,	110	115	125	92	107	105	107	105	107	110	100	94	100	100	100	100
Berks,	102	101	87	89	92	100	100	100	95	97	84	89	97	100	100	100
Blair,	107	107	102	100	100	100	100	100	100	100	94	97	92	97	100	100
Bradford,	90	92	97	90	94	97	92	92	95	100	90	87	85	94	100	100
Bucks,	87	82	90	90	92	95	100	100	94	97	87	85	90	92	100	100
Butler,	101	93	95	87	90	97	90	90	102	100	90	90	87	97	95	95
Cambria,	93	92	89	89	90	92	95	96	99	98	87	90	91	97	97	98
Cameron,	98	88	102	100	102	94	96	98	98	98	92	90	92	97	98	99
Carbon,	100	100	100	100	97	98	95	95	100	100	92	95	98	95	95	95
Centre,	105	107	125	100	100	110	110	112	100	100	93	97	92	100	100	100
Chester,	104	100	90	75	95	95	87	90	100	100	90	82	97	92	90	92
Clarion,	109	105	97	90	91	92	93	95	102	101	98	90	95	87	97	92
Clearfield,	101	102	100	100	91	92	97	96	100	100	95	94	92	100	100	100
Clinton,	100	100	102	103	100	100	100	100	101	102	92	96	97	97	98	100
Columbia,	85	89	97	100	100	92	97	98	93	97	92	95	93	98	100	100
Crawford,	93	90	98	92	102	103	100	100	98	97	92	94	97	95	100	100
Cumberland,	100	97	95	97	100	100	95	92	100	95	90	87	97	98	99	100
Dauphin,	95	95	97	92	100	100	94	96	100	100	94	93	97	94	93	97
Delaware,	105	99	93	90	98	94	95	95	100	100	90	87	89	92	93	94
Elk,	105	100	97	97	95	95	97	94	102	100	92	97	95	97	97	97
Erie,	97	95	85	91	97	98	100	90	97	97	90	85	87	92	97	95
Fayette,	100	100	97	92	91	90	90	90	100	100	92	90	89	89	93	94
Forest,	102	101	100	98	97	100	97	98	101	100	90	85	92	97	100	100
Franklin,	111	100	100	87	90	95	90	92	108	101	90	92	93	94	97	97
Fulton,	115	117	100	91	92	91	94	96	110	109	95	94	93	92	97	99
Greene,	104	100	100	95	97	100	100	100	102	101	92	93	97	98	100	100
Huntingdon,	105	110	100	90	97	92	90	100	104	106	90	90	93	97	95	100
Indiana,	92	95	100	89	89	92	100	100	95	96	92	87	87	90	97	98
Jefferson,	95	100	100	90	89	95	97	97	100	100	92	90	87	90	98	97
Juniata,	89	89	97	95	92	100	90	92	87	85	90	91	90	97	94	97
Lackawanna,	100	97	100	92	94	97	97	94	100	98	92	97	97	99	97	97
Lancaster,	108	102	102	93	100	100	100	97	103	103	90	87	94	97	100	100
Lawrence,	107	105	97	92	94	100	95	96	104	102	92	91	90	98	100	100
Lebanon,	105	104	102	98	94	100	100	100	101	102	90	91	90	97	100	100
Lehigh,	101	102	100	97	97	92	100	100	100	100	94	95	97	100	95	97
Luzerne,	108	109	100	100	100	102	100	100	110	110	90	90	91	98	97	98
Lycoming,	100	100	98	100	100	100	100	100	94	95	92	95	94	98	98	97
McKean,	92	93	98	97	94	95	95	95	100	100	92	94	90	100	97	97
Mercer,	97	96	99	92	90	100	100	100	100	100	94	90	90	97	99	99
Mifflin,	109	107	112	92	110	111	105	105	110	107	90	94	97	98	100	100
Monroe,	100	100	94	92	94	100	100	100	100	100	90	89	90	97	100	100
Montgomery,	104	103	98	92	90	94	92	94	106	102	90	87	89	94	97	97
Montour,	103	104	94	95	98	98	100	92	102	103	90	92	92	98	100	100
Northampton,	111	110	102	94	98	98	100	91	106	106	91	92	94	97	100	98
Northumberl'd,	87	97	100	100	97	100	100	94	92	99	90	94	99	97	99	92
Perry,	101	103	98	90	92	93	97	92	100	101	90	92	94	98	99	92
Philadelphia,	110	111	100	100	95	100	97	94	108	108	92	93	97	98	99	94
Pike,	102	101	100	100	94	97	100	100	100	100	90	97	94	100	100	100
Potter,	97	95	98	95	100	100	95	94	100	100	92	93	97	93	97	94
Schuylkill,	94	95	107	95	90	90	94	90	97	97	90	92	94	98	97	93
Snyder,	100	100	100	97	94	100	97	94	100	100	92	94	97	97	98	94
Somerset,	98	98	99	92	97	98	100	94	97	97	90	92	94	97	100	92
Sullivan,	97	98	89	90	92	98	100	92	95	98	91	91	94	98	100	91
Susquehanna,	90	90	100	94	97	92	98	91	93	92	90	94	97	92	99	90
Tioga,	94	97	98	90	95	92	100	90	97	97	92	92	97	98	98	93
Union,	80	82	94	92	90	95	97	90	87	89	90	98	94	97	97	92
Venango,	90	91	98	91	97	99	100	92	100	100	92	97	95	94	100	98
Warren,	102	103	101	93	93	100	100	94	103	103	92	94	95	100	100	97
Washington,	90	90	95	94	92	97	97	90	95	97	91	94	93	98	98	94
Wayne,	97	93	100	94	97	98	96	90	98	95	94	97	98	97	98	93
Westmoreland,	88	89	102	95	96	98	100	95	98	90	94	92	97	98	97	96
Wyoming,	94	93	98	97	96	97	98	94	95	94	91	94	97	98	100	95
York,	104	100	98	100	95	100	100	100	103	101	89	90	94	100	100	100

YIELD OF CROPS, NOVEMBER, 1882.

Counties.	Compared with last year, as 100.								Compared with average of past five years, as 100.							
	Wheat.	Rye.	Oats.	Corn.	Hay.	Straw.	Potatoes.	Garden products.	Wheat.	Rye.	Oats.	Corn.	Hay.	Straw.	Potatoes.	Garden products.
Adams,	125	120	87	85	117	125	130	107	120	115	77	100	110	120	110	97
Allegheny,	107	110	92	110	117	118	115	102	108	110	100	95	100	97	97	100
Armstrong,	105	100	102	115	110	103	107	100	100	100	100	102	107	104	98	100
Beaver,	105	100	90	107	106	105	105	107	107	100	100	97	103	108	99	102
Bedford,	115	100	75	126	117	120	118	115	103	102	75	95	102	103	100	100
Berks,	100	100	75	107	106	100	95	100	97	100	97	92	97	110	85	90
Blair,	103	103	110	100	117	115	75	100	100	105	102	91	110	100	75	100
Bradford,	110	104	97	140	110	102	130	110	115	117	103	95	107	97	90	102
Bucks,	108	105	72	114	107	104	94	113	105	104	85	77	100	102	89	94
Butler,	105	111	75	112	106	117	90	111	107	110	80	100	105	100	90	100
Cambria,	117	119	104	117	117	112	175	116	105	108	100	102	104	100	100	100
Cameron,	108	107	90	94	107	108	107	100	103	102	100	97	101	102	100	100
Carbon,	114	115	75	104	100	111	114	100	100	100	75	100	100	101	102	100
Centre,	110	104	100	114	111	110	105	107	105	105	100	107	106	109	99	103
Chester,	110	100	90	119	107	107	113	105	104	102	95	104	107	102	102	100
Clarion,	113	113	97	135	124	114	117	110	110	110	92	100	110	100	107	107
Clearfield,	106	105	93	119	107	101	121	110	102	102	94	97	106	100	100	100
Clinton,	113	102	100	150	124	114	130	118	108	100	111	89	123	110	100	100
Columbia,	93	100	100	120	110	100	106	100	98	97	94	90	97	100	100	100
Crawford,	115	108	97	109	107	102	122	100	110	102	97	100	113	105	100	102
Cumberland,	120	107	87	126	107	103	150	104	110	102	84	110	100	100	110	105
Dauphin,	99	100	70	100	95	100	110	100	97	100	84	100	100	97	100	100
Delaware,	120	98	85	113	120	120	90	94	118	100	95	100	110	114	83	96
Elk,	110	102	79	117	100	100	107	100	102	100	89	100	105	100	100	100
Erie,	105	100	83	96	104	90	117	104	103	100	90	96	104	95	104	102
Fayette,	110	105	80	140	100	94	104	120	104	100	90	104	107	104	110	103
Forest,	121	104	70	100	130	100	117	110	105	100	89	92	100	100	100	101
Franklin,	130	110	80	140	100	115	140	114	107	104	84	100	99	100	118	103
Fulton,	110	115	94	130	110	100	117	111	100	100	95	100	105	100	100	103
Greene,	113	106	94	100	116	110	120	104	110	110	90	100	110	103	110	102
Huntingdon,	104	102	94	107	113	104	160	110	100	100	92	100	110	104	111	103
Indiana,	103	101	100	110	113	104	126	105	102	100	100	95	113	104	107	105
Jefferson,	117	100	90	120	100	100	90	104	105	100	94	105	100	100	95	110
Juniata,	113	110	89	124	128	110	124	105	110	107	90	100	105	100	100	103
Lackawanna,	110	103	98	82	117	107	116	104	104	100	98	89	110	103	104	100
Lancaster,	140	117	87	120	121	135	107	113	120	118	94	105	104	111	108	108
Lawrence,	95	100	110	175	123	114	135	100	100	100	103	118	105	105	107	100
Lebanon,	113	112	79	130	114	111	133	120	102	101	94	107	110	104	102	111
Lehigh,	107	103	96	104	106	109	94	100	100	102	95	100	100	103	97	100
Luzerne,	94	100	89	75	100	100	98	100	93	100	95	74	98	100	100	100
Lycoming,	103	100	102	113	111	102	107	105	100	100	100	92	100	100	103	100
McKean,	112	105	85	80	113	102	100	94	107	102	87	75	110	100	90	96
Mercer,	102	103	92	107	112	104	107	103	103	103	98	100	107	102	98	100
Mifflin,	110	103	97	123	114	104	128	114	105	100	93	95	110	100	100	110
Monroe,	130	132	99	79	117	113	85	97	110	110	87	87	115	110	80	94
Montgomery,	113	110	83	115	117	115	119	100	107	105	93	100	104	100	98	100
Montour,	118	117	100	119	116	119	120	104	109	107	100	100	111	112	114	100
Northampton,	115	105	87	104	107	103	102	112	107	103	90	100	103	100	100	104
Northumberland,	104	107	89	117	92	100	123	111	100	100	100	97	100	100	100	104
Perry,	101	103	82	124	105	100	140	125	100	100	89	100	102	104	115	107
Philadelphia,	130	130	95	105	100	115	110	111	140	140	100	93	94	103	83	104
Pike,	120	115	90	97	121	123	85	92	109	104	97	87	113	107	93	100
Potter,	103	103	90	90	110	90	110	102	101	102	97	89	103	100	95	102
Schuylkill,	102	104	75	117	107	110	108	114	103	107	95	105	111	114	97	104
Snyder,	90	100	79	111	97	93	102	104	91	92	84	90	97	100	97	102
Somerset,	97	90	87	97	100	100	90	100	100	100	89	94	89	92	91	100
Sullivan,	114	102	100	100	100	100	123	120	107	103	100	99	100	97	118	113
Susquehanna,	107	105	89	97	100	100	111	104	103	104	92	100	100	100	100	102
Tioga,	110	100	110	116	100	100	112	113	102	100	100	111	100	100	100	104
Union,	95	95	90	84	100	100	115	104	97	97	95	84	95	94	100	100
Venango,	103	100	97	123	110	105	135	150	102	100	103	114	105	107	113	110
Warren,	103	103	101	87	111	95	104	107	102	102	95	98	114	95	98	103
Washington,	106	105	78	112	107	120	127	110	105	104	87	102	100	100	100	105
Wayne,	115	110	78	102	115	104	107	100	105	100	85	97	107	97	100	100
Westmoreland,	115	101	104	113	100	100	102	111	103	100	100	100	113	100	98	100
Wyoming,	107	100	101	92	112	100	130	107	104	100	107	90	103	95	123	100
York,	117	102	93	114	112	110	115	100	117	103	89	107	110	111	107	98

CONDITION OF LIVE STOCK—MAY, 1882.

Counties.	Compared with same time last year.								Compared with average of past five years.							
	Horses.	Mules.	Oxen.	Cows.	Sheep.	Swine.	Fat cattle.	Poultry.	Horses.	Mules.	Oxen.	Cows.	Sheep.	Swine.	Fat cattle.	Poultry.
Adams,	100	100	95	98	90	94	105	100	100	100	92	90	91	93	100	100
Allegheny,	97	94	90	85	79	94	97	99	96	93	90	87	90	93	97	100
Armstrong,	95	95	90	87	90	90	98	97	94	94	92	89	94	94	97	100
Beaver,	105	105	100	100	97	98	90	96	100	100	100	94	95	97	92	97
Bedford,	89	89	85	80	97	90	90	100	92	92	90	90	94	95	94	100
Berks,	87	87	89	89	90	95	97	100	95	95	94	96	97	100	100	100
Blair,	95	95	89	90	91	95	98	95	97	97	94	97	98	99	100	100
Bradford,	95	95	94	93	98	97	90	97	97	96	97	95	100	100	100	98
Bucks,	100	100	95	94	100	97	95	100	100	100	97	96	100	98	100	100
Butler,	90	90	90	87	90	94	93	97	96	97	94	92	97	98	100	100
Cambria,	93	94	90	90	97	94	90	100	97	97	92	98	94	99	100	100
Cameron,	89	89	84	90	92	90	90	94	92	93	90	97	96	94	97	100
Carbon,	90	87	90	90	97	90	89	98	93	92	95	98	100	95	97	100
Centre,	93	94	93	91	94	96	97	98	97	97	95	94	100	97	100	100
Chester,	98	98	97	97	96	99	99	100	100	100	100	100	97	99	100	100
Clarion,	90	91	94	93	92	97	98	100	94	96	97	94	96	100	100	100
Clearfield,	89	89	90	91	93	96	97	100	94	97	92	99	98	98	100	100
Clinton,	96	94	94	93	92	97	94	95	97	97	97	95	96	98	100	95
Columbia,	92	96	97	92	92	96	98	99	96	97	100	94	96	100	100	100
Crawford,	98	98	94	95	96	94	97	92	100	100	100	97	98	97	96	94
Cumberland,	94	93	91	96	94	97	99	100	97	98	93	100	100	98	97	98
Dauphin,	93	92	92	90	96	97	92	100	95	95	96	97	100	100	97	100
Delaware,	100	100	94	95	92	98	93	97	100	100	100	97	99	96	99	100
Elk,	95	92	94	89	90	94	. . .	90	96	97	97	90	92	94	.	98
Erie,	92	96	87	90	92	100	100	100	98	100	90	93	100	100	100	100
Fayette,	97	96	90	90	94	98	100	92	96	97	96	94	98	98	100	100
Forest,	94	97	90	87	90	97	. . .	97	67	88	94	96	97	100	. . .	100
Franklin,	98	92	95	91	93	97	100	98	99	96	98	97	98	97	100	100
Fulton,	97	94	100	90	96	97	94	99	100	100	100	100	97	97	92	93
Greene,	99	96	93	90	94	100	95	92	100	100	97	96	96	97	100	100
Huntingdon,	100	97	99	92	90	94	97	100	98	100	100	99	99	100	97	100
Indiana,	96	93	100	98	100	95	98	100	100	100	100	100	100	100	100	100
Jefferson,	95	92	100	89	100	97	99	100	97	96	100	100	92	97	99	99
Juniata,	97	94	92	91	98	96	100	98	100	100	100	97	96	94	97	100
Lackawanna,	96	96	97	87	94	92	. . .	94	100	100	100	100	97	98	97	100
Lancaster,	96	96	96	93	100	100	100	100	100	100	100	96	97	94	92	100
Lawrence,	97	97	93	89	94	100	94	96	97	97	100	96	94	93	9	100
Lebanon,	92	92	97	94	93	100	95	98	96	96	97	100	100	100	97	100
Lehigh,	94	90	96	92	94	100	97	100	97	92	97	96	94	100	98	100
Luzerne,	94	91	89	94	97	92	92	92	96	95	94	97	98	96	99	100
Lycoming,	92	90	89	89	96	96	91	100	97	99	92	97	97	98	96	100
McKean,	89	96	96	84	94	90	. .	97	96	97	96	92	97	97	. . .	93
Mercer,	92	90	97	90	90	91	94	98	96	96	96	92	95	100	100	97
Mifflin,	93	91	96	97	94	97	96	100	98	97	100	100	97	97	100	100
Monroe,	87	88	95	92	92	98	.	100	92	93	97	96	100	100	97	100
Montgomery,	96	94	92	95	100	98	100	100	100	100	98	100	100	100	100	100
Montour,	97	90	93	94	100	100	.	92	100	100	97	93	100	100	. . .	100
Northampton,	97	98	97	98	100	94	100	97	100	97	100	100	100	97	100	97
Northumberland,	98	90	94	96	97	92	100	100	98	94	97	97	93	98	100	100
Perry,	89	90	93	94	98	91	100	96	92	94	97	96	100	100	100	97
Philadelphia,	93	97	98	93	. . .	96	. . .	99	100	100	100	100	. .	98	. . .	100
Pike,	87	86	97	92	90	90	92	92	92	92	98	97	96	92	94	97
Potter,	89	85	96	93	97	92	97	94	95	95	95	96	100	100	100	100
Schuylkill,	87	86	95	90	94	97	98	97	92	94	97	92	93	93	100	100
Snyder,	92	87	96	87	93	90	98	92	95	95	97	92	90	96	100	97
Somerset,	96	92	97	88	92	98	91	95	100	100	100	92	96	97	94	97
Sullivan,	95	97	92	90	90	91	93	94	97	97	96	94	97	98	93	96
Susquehanna,	94	96	94	90	90	94	95	97	100	100	100	100	100	97	97	100
Tioga,	96	100	98	89	89	92	94	90	100	100	100	94	96	97	97	98
Union,	92	94	97	94	94	93	96	100	94	97	97	100	100	100	97	100
Venango,	87	86	92	85	95	94	100	100	95	95	97	92	96	97	100	100
Warren,	89	89	90	87	96	97	100	100	94	94	96	92	100	100	100	100
Washington,	94	93	98	90	97	92	94	94	100	100	100	97	100	96	97	100
Wayne,	93	92	90	91	94	94	97	100	98	97	96	94	100	97	100	100
Westmoreland,	97	96	90	92	93	93	96	93	100	100	94	96	98	94	97	96
Wyoming,	96	94	89	80	92	94	92	99	100	100	97	96	97	97	98	100
York,	92	95	92	90	96	95	98	100	100	100	100	96	97	98	100	100

CONDITION OF LIVE STOCK, NOVEMBER 1, 1882.

COUNTIES.	COMPARED WITH LAST YEAR, AS 100.								COMPARED WITH AVERAGE OF PAST FIVE YEARS, AS 100.							
	Horses.	Mules.	Oxen.	Cows.	Sheep.	Swine.	Fat cattle.	Poultry.	Horses.	Mules.	Oxen.	Cows.	Sheep.	Swine.	Fat cattle.	Poultry.
Adams,	101	102		110	100	95	110	87	100	101		105	100	90	110	89
Allegheny,	107	105	100	120	115	100	110	100	110	100	100	110	100	110	111	100
Armstrong,	105		. .	109	103	110	110	100	100			102	101	104	104	100
Beaver,	102	105		102	95	97	103	100	100	100		109	97	98	102	100
Bedford,	100	100	100	111	100	115	110	100	100	100	97	109	100	111	104	102
Berks,	107	105	103	100	102	100	102	100	103	104	105	100	102	104	102	97
Blair,	99	100	103	99	100	100	90	90	104	102	102	100	100	97	90	90
Bradford,	102	103	104	103	107	100	97	100	100	100	100	103	104	100	98	97
Bucks,	106	105	97	113	100	106	103	100	105	105	97	103	100	102	95	100
Butler,	97	100	100	106	103	102	102	101	100	104	100	104	107	100	97	100
Cambria,	102	100	103	105	100	111	114	102	100	95	100	101	103	107	105	100
Cameron,	100	100	. .	104	103	107	104	100	100	100		105	104	103	102	101
Carbon,	95	97	100	115	102	117	100	98	95	99	97	104	101	111	102	97
Centre,	100	100	100	107	105	90	110	103	100	100	100	104	103	94	107	102
Chester,	97	95	96	100	100	100	103	100	95	95	97	100	103	102	100	100
Clarion,	98	98	97	110	115	104	117	105	95	95	99	104	111	100	113	102
Clearfield,	105	100	108	115	105	111	120	100	110	110	100	105	105	100	110	103
Clinton,	110	100	100	113	109	112	117	100	105	100	100	107	105	109	110	100
Columbia,	100	100	107	115	105	103	103	101	97	98	103	111	102	100	100	103
Crawford,	107	105	107	113	100	100	120	100	104	103	104	106	100	100	113	102
Cumberland,	100	100	98	107	102	106	111	90	100	100	94	102	100	100	107	92
Dauphin,	100	95	94	100	92	100	110	100	100	97	94	100	100	100	103	100
Delaware,	105	105	103	107	107	100	105	95	105	105	100	110	110	105	110	100
Elk,	102	103	100	115	112	100	110	100	100	100	95	104	107	100	104	95
Erie,	110	105	104	110	105	100	110	104	105	103	100	105	100	105	104	100
Fayette,	110	100	105	110	104	111	107	100	105	105	103	102	105	105	110	102
Forest,	103	103	100	110	102	104	111	103	101	101	100	104	100	100	103	102
Franklin,	105	105	125	120	110	100	115	107	100	100	111	112	104	100	107	104
Fulton,	111	110	113	120	121	100	117	105	104	106	108	111	111	100	117	102
Greene,	107	105	107	110	115	105	107	90	103	102	104	106	107	103	102	100
Huntingdon,	106	105	100	107	97	104	111	87	100	100	100	103	99	100	107	92
Indiana,	105	105	100	119	100	92	100	80	102	103	100	108	100	100	100	80
Jefferson,	104	103	100	123	90	100	113	100	100	100	100	111	97	100	107	100
Juniata,	98	95	99	100	100	104	107	103	97	93	94	100	103	106	109	105
Lackawanna,	103	102	107	110	97	98	102	106	100	100	103	105	98	98	100	103
Lancaster,	108	108	110	114	115	100	107	100	110	110	110	107	108	100	110	100
Lawrence,	105	103	110	115	104	100	111	102	102	102	105	111	103	100	107	100
Lebanon,	99	98	97	103	102	100	107	100	100	100	97	100	100	100	103	100
Lehigh,	100	100	102	105	105	100	107	105	100	100	100	102	103	104	107	100
Luzerne,	108	109	110	120	120	103	111	100	105	104	105	111	106	105	111	102
Lycoming,	104	103	104	100	107	98	102	103	101	100	102	103	102	100	100	100
McKean,	102	103	100	100	97	95	100	100	100	100	100	100	98	99	104	100
Mercer,	105	103	110	113	113	103	115	100	105	102	105	110	105	100	110	107
Mifflin,	104	106		113	112	95	107	103	97	95		110	110	97	103	102
Monroe,	100	100	95	95	97	100	102	100	100	100	97	94	100	100	100	100
Montgomery,	100	100	95	98	97	98	100	100	100	100	100	100	97	94	100	100
Montour,	104	103	100	102	107	100	111	100	102	100	104	108	104	100	104	100
Northampton,	106	105	100	107	100	104	97	103	105	104	100	105	100	100	100	102
Northumberland,	104	103	100	106	104	100	102	100	103	100	100	102	100	100	100	100
Perry,	105	105	110	110	105	100	106	106	103	103	107	105	100	104	107	100
Philadelphia,	100	100		100	.	100	106	95	100	100		107		104	103	100
Pike,	100	100	110	110	102	100	112	100	100	100	102	105	110	112	110	102
Potter,	103	105	100	105	110	106	110	107	102	103	100	104	110	105	107	106
Schuylkill,	111	110	102	109	102	100	111	100	107	105	100	109	107	100	107	100
Snyder,	98	97	99	100	102	100	102	109	100	100	98	102	97	98	100	107
Somerset,	106	105	100	111	112	107	111	100	102	103	100	107	111	104	107	100
Sullivan,	106	107	104	103	107	100	109	95	100	103	100	105	104	102	106	94
Susquehanna,	100	100	100	112	111	104	115	90	98	98	95	109	103	102	109	93
Tioga,	101	103	100	110	108	100	112	97	100	100	100	105	106	100	107	97
Union,	109	110	107	113	107	107	113	100	106	107	103	104	102	104	103	100
Venango,	109	106	115	115	117	109	117	107	107	107	110	110	112	107	112	105
Warren,	103	102	107	112	106	102	103	94	100	100	105	110	103	100	100	97
Washington,	111	107	104	115	110	103	117	104	107	106	107	104	103	100	110	103
Wayne,	101	103	102	107	105	100	106	100	100	100	103	103	100	104	103	100
Westmoreland,	112	110	103	113	107	100	114	103	104	105	102	107	103	100	105	100
Wyoming,	104	103	107	109	103	104	107	100	100	100	100	108	100	102	105	100
York,	110	107	105	112	109	100	107	100	104	103	103	107	102	104	106	100

PRICES OF FARM PRODUCTS AND LIVE STOCK, MAY 10, 1881.

Compiled from the consolidated returns of four hundred and fifty official reporters appointed by members of the Senate and House of Representatives.

COUNTIES.	Wheat, per bushel.	Rye, per bushel.	Oats, per bushel.	Corn, (shelled,) per bushel.	Clover seed, per bushel.	Timothy seed, per bushel	Potatoes, per bus.	Hay, (clover,) per ton.	Hay, (timothy,) per ton.	Butter, per pound.	Ewes, per head.	Lambs, per head.	Horses, average.	Mules, average.	Cows, average.	Poultry, (dressed,) per pound.
			cts	cts						cts						cts
Adams, ...	$1 05	$0 82	36	47	$4 73	$2 60	$0 65	$11 25	$14 10	20	$3 87	$2 50	$100	$115	$27	9
Allegheny, . .	1 12	1 02	44	56	5 37	2 80	90	18 10	21 56	35	3 62	3 00	122	125	33	12
Armstrong, . .	1 02	94	47	57	5 00	3 00	72	14 12	18 20	26	5 04	3 00	124	125	23	10
Beaver, ...	1 05	1 00	42	60	5 73	2 87	1 00	13 50	17 75	28	4 00	3 13	105	107	30	12
Bedford, ...	1 00	80	37	56	4 10	2 75	72	12 15	15 20	20	3 75	2 87	115	120	24	7
Berks, ...	1 08	90	43	51	4 50	3 00	73	18 75	22 10	24	. . .	. .	100	107	35	11
Blair, ...	1 02	81	40	52	6 00	3 12	49	20 70	22 50	19	4 10	3 15	115	120	31	12
Bradford, . . .	1 07	77	41	56	6 05	3 27	62	12 25	16 30	21	4 54	3 10	115	110	34	10
Bucks, ...	1 12	85	45	59	6 25	2 70	95	18 25	21 50	35	4 75	3 87	120	120	42	15
Butler, ...	1 03	85	41	54	5 50	2 90	71	12 00	15 15	27	4 25	3 15	111	105	32	9
Cambria, ...	1 05	80	46	60	5 35	3 00	87	16 20	19 25	24	3 80	2 25	120	118	29	9
Cameron, . . .	1 20	83	49	75	5 50	3 15	75	18 00	22 15	28	. .	. . .	95	92	27	
Carbon, ...	1 18	86	45	67	5 75	3 15	57	19 10	22 75	29	3 60	2 87	100	102	23	11
Centre, ...	1 00	60	35	50	4 60	3 10	55	16 25	18 85	18	3 25	2 50	115	102	30	10
Chester, ...	1 15	94	43	56	5 73	2 75	95	18 20	21 15	34	5 75	4 75	115	117	37	13
Clarion, . . .	1 00	73	40	63	6 00	2 70	74	13 00	15 00	30	3 37	2 73	105	95	28	10
Clearfield, . . .	1 20	88	50	78	6 50	3 50	82	15 50	17 25	25	3 10	2 62	118	115	28	10
Clinton, ...	1 07	80	48	57	5 25	3 50	92	13 50	22 50	25	4 10	2 73	93	93	30	10
Columbia, . . .	1 05	75	42	56	5 50	2 50	63	17 20	20 25	27	3 75	3 00	107	110	27	10
Crawford, . . .	1 05	65	40	56	5 25	3 00	75	13 00	15 10	23	4 25	3 00	105	111	34	10
Cumberland, .	1 07	90	35	47	4 25	2 75	68	11 25	13 75	23	3 87	2 70	100	100	30	9
Dauphin, . . .	1 12	92	44	56	5 15	2 60	78	18 00	21 00	28	3 75	2 62	112	115	30	8
Delaware, . . .	1 18	95	47	58	6 10	3 15	95	20 00	22 10	35	4 75	4 75	111	113	41	15
Elk, ...	1 22	90	55	85	6 50	3 50	92	25 00	27 00	28	3 75	2 62	100	100	33	
Erie, ...	1 12	92	38	56	4 75	2 50	87	13 00	15 25	23	5 00	3 00	102	105	38	18
Fayette, ...	1 06	84	40	60	5 75	3 00	90	16 00	18 10	26	. . .	.	110	107	32	10
Forest, ...	1 00	90	47	65	5 25	3 00	70	16 50	21 10	28	3 73	2 50	105	110	33	10
Franklin, . . .	1 07	83	36	47	4 75	2 60	65	12 10	15 25	20	3 75	2 75	105	100	23	10
Fulton, ...	1 10	90	41	59	5 00	2 75	72	14 75	18 10	21	3 50	2 73	95	102	25	9
Greene, ...	1 00	67	37	54	5 10	3 15	87	18 75	15 25	24	4 15	3 73	102	105	34	11
Huntingdon, .	1 01	65	35	51	4 60	2 75	72	14 30	15 75	21	4 50	3 25	100	93	23	8
Indiana, ...	1 05	97	39	53	5 00	2 65	94	12 73	14 75	26	4 15	3 10	115	118	27	9
Jefferson, . . .	1 02	74	48	50	5 75	2 73	78	15 00	17 10	20	3 25	2 75	108	110	28	9
Juniata, ...	1 06	71	37	43	4 75	3 00	58	15 10	18 00	18	3 10	2 15	100	100	30	8
Lackawanna, .	1 14	73	45	56	6 10	3 20	95	18 20	20 15	24	4 25	3 73	105	110	33	12
Lancaster, . . .	1 00	78	46	55	5 75	3 50	80	18 00	20 25	34	4 50	4 00	120	107	35	13
Lawrence, . . .	1 05	92	40	51	5 25	3 75	90	15 00	16 75	23	4 25	3 00	110	114	30	10
Lebanon, . . .	1 11	94	41	55	5 10	3 90	90	18 75	20 50	19	4 15	4 73	111	115	27	11
Lehigh, . . .	1 10	90	45	55	5 40	3 00	76	18 20	21 50	25	4 30	3 40	113	114	30	11
Luzerne, ...	1 18	80	45	59	5 50	3 50	97	22 50	24 12	24	4 00	3 25	115	115	30	12
Lycoming, . .	1 10	95	45	55	5 10	3 00	75	15 25	17 50	25	3 15	2 00	94	95	21	12
McKean, ...	1 20	76	47	63	7 00	3 50	87	11 25	14 50	25	4 00	3 00	100	100	28	10
Mercer, ...	1 05	70	40	62	5 25	3 10	90	12 50	14 75	20	5 10	3 87	113	115	29	9
Mifflin, ...	1 04	70	37	45	4 75	3 10	59	11 50	13 73	19	3 25	2 50	102	105	25	9
Monroe, ...	1 13	19	43	63	5 60	3 73	85	17 25	13 73	25	4 10	3 75	110	110	30	11
Montgomery, .	1 15	90	45	57	6 25	3 25	95	18 50	21 10	37	4 00	3 75	100	95	34	13
Montour, . . .	1 10	80	43	56	4 37	3 75	78	15 10	22 50	29	4 10	3 15	110	110	30	12
Northampton,	1 07	89	41	57	5 30	3 50	65	18 00	21 75	30	3 75	3 00	98	100	30	10
Northumberl'd	1 10	90	45	55	4 75	3 10	74	18 20	21 25	30	4 73	3 87	111	112	30	12
Perry, ...	1 05	78	37	48	4 75	2 50	68	13 75	15 80	20	4 00	2 75	94	98	22	8
Philadelphia, .	1 15	1 00	42	59	6 50	3 00	1 00	25 25	30 00	35	6 15	6 00	125	128	42	15
Pike, ...	1 22	87	48	62	6 15	3 20	64	18 00	20 50	25	4 10	3 00	111	105	26	12
Potter, ...	1 20	77	47	62	6 25	3 50	80	12 50	14 50	20	3 75	3 00	102	105	24	9
Schuylkill, . . .	1 10	74	48	61	6 00	3 00	73	20 00	21 00	30	4 75	3 73	110	112	33	12
Snyder, ...	1 09	79	38	54	4 77	3 00	63	17 25	20 50	22	3 87	2 90	111	110	25	8
Somerset, . . .	1 02	76	37	61	6 50	3 00	57	11 73	14 25	21	4 10	3 50	102	105	26	9
Sullivan, ...	1 07	75	42	60	6 00	3 25	57	16 10	17 25	20	4 30	3 10	98	100	23	10
Susquehanna, .	1 15	60	45	60	6 25	3 25	67	13 25	15 50	22	5 00	3 75	100	100	30	12
Tioga, ...	1 13	82	41	61	6 00	3 50	57	11 50	13 75	21	5 50	4 00	113	120	31	11
Union, ...	1 05	87	40	54	5 10	2 50	58	15 10	16 50	30	5 00	2 75	107	110	26	10
Venango, . . .	1 10	90	50	70	6 25	3 25	73	13 73	15 50	26	4 00	3 00	100	100	27	10
Warren, ...	1 18	98	41	62	6 00	3 10	80	12 50	13 75	19	5 00	3 00	100	100	34	11
Washington, .	1 05	73	43	55	6 00	2 87	85	14 50	17 60	30	4 15	3 10	90	95	33	12
Wayne, ...	1 22	84	50	62	6 00	3 00	68	13 50	15 73	21	4 00	2 90	110	112	26	12
Westmoreland,	1 06	82	37	56	5 50	2 73	90	12 50	15 00	22	5 73	4 00	100	100	25	11
Wyoming, . . .	1 15	85	43	50	6 00	3 60	63	13 10	15 25	23	4 75	3 00	110	110	30	12
York, ...	1 12	94	43	50	5 00	3 50	73	16 25	18 75	21	4 00	3 73	115	115	26	12

PRICES OF FARM PRODUCTS AND FARM STOCK, OCTOBER 25, 1882.

Counties.	Wheat per bushel.	Rye per bushel.	Oats per bushel.	Corn (shelled,) per bushel.	Potatoes per bushel.	Clover seed per bushel.	Timothy seed per bushel.	Hay, (clover,) per ton.	Hay, (timothy,) per ton.	Butter per pound.	Ewes, (fat,) per head.	Lambs, (fat,) per head.	Horses, average.	Mules, average.	Cows, average.	Poultry (fat,) per lb.
			cts							cts						cts
Adams,	$0 98	$0 70	37	$0 60	$0 60	$4 30	$2 00	$9 00	$11 00	22	$4 00	$3 00	$130	$145	$35	9
Allegheny,	1 03	72	48	78	70	5 00	2 30	11 00	14 75	36	4 25	3 25	160	167	40	11
Armstrong,	1 00	65	43	70	47	4 50	2 20	9 75	10 25	28	4 00	3 10	125	120	32	9
Beaver,	1 05	80	42	77	62	5 25	2 25	9 50	11 50	33	4 00	3 50	150	147	43	12
Bedford,	1 02	75	50	80	45	5 30	3 00	9 00	11 00	30	3 75	3 00	115	120	31	9
Berks,	1 05	75	41	80	65	5 50	3 00	16 00	18 50	27			143	140	40	11
Blair,	1 05	75	49	77	45	5 00	3 00	10 00	13 00	22	4 00	3 00	140	160	29	8
Bradford,	1 02	70	41	80	43	6 00	3 00	7 00	8 50	28	4 00	3 50	145	150	36	11
Bucks,	1 12	83	45	78	90	5 75	3 00	13 00	15 00	40	5 50	4 50	200	200	70	20
Butler,	1 00	77	45	85	50	5 25	2 76	7 00	9 00	30	4 00	3 00	100	110	35	9
Cambria,	1 09	75	50	75	43	5 75	3 00	8 25	10 50	25	4 00	3 00	150	150	30	7
Cameron,	1 00	79	65	85	50	5 50	2 75	10 00	11 25	35			130	135	30	8
Carbon,	1 10	90	50	90	60	6 00	3 25	18 00	20 00	30			125	135	20	12
Centre,	98	73	45	76	45	4 50	2 25	9 50	11 00	27	4 25	3 50	130	140	35	7
Chester,	1 00	85	50	78	77	5 75	3 00	15 00	17 50	40	5 50	5 50	140	160	50	16
Clarion,	1 03	75	40	77	42	5 25	3 25	8 00	10 00	28	3 75	3 00	135	135	30	11
Clearfield,	1 10	85	55	90	50	5 50	3 00	13 00	14 50	33	3 50	3 00	150	150	35	12
Clinton,	1 00	75	48	75	50	4 50	3 00	10 00	12 00	27	4 50	4 00	120	125	35	10
Columbia,	1 10	80	48	85	40	6 00	3 00	11 00	13 00	30	4 75	4 00	100	100	28	9
Crawford,	98	76	42	64	43	5 25	3 10	7 75	9 00	27	4 00	3 00	137	140	27	10
Cumberland,	98	70	38	75	42	4 00	3 00	10 00	13 00	23	4 00	3 00	140	145	37	11
Dauphin,	1 05	83	45	90	50	4 00	2 50	10 00	12 75	25	3 75	3 25	127	140	35	10
Delaware,	1 05	87	51	80	89	6 00	3 25	15 00	16 50	50	4 50	4 50	150	160	63	17
Elk,	97	80	43	70	51	5 25	3 00	11 00	12 00	30	4 00	4 50	130	160	63	19
Erie,	1 00	80	40	80	51	5 10	3 25	7 75	11 00	29	3 75	3 25	127	130	30	10
Fayette,	1 05	77	41	90	50	4 50	3 00	9 00	11 00	27	3 75	3 00	130	140	36	10
Forest,	1 05	85	48	82	43	5 10	3 20	9 25	11 75	30	3 90	2 75	127	133	30	7
Franklin,	99	75	40	86	40	4 30	3 00	10 25	11 75	25	4 00	3 75	130	135	32	8
Fulton,	1 00	90	55	79	43	5 00	2 75	10 00	12 00	27	4 75	3 75	105	115	27	8
Greene,	95	75	40	70	45	4 50	3 00	9 50	9 75	25	3 75	2 75	100	110	35	7
Huntingdon,	1 00	75	47	83	43	4 50	2 25	8 50	10 00	25	4 50	4 00	120	125	32	8
Indiana,	1 05	80	43	85	50	4 75	3 00	7 50	10 00	24	4 00	3 00	150	140	35	7
Jefferson,	1 00	83	40	89	45	5 50	3 25	8 00	11 00	25	3 75	3 25	130	140	33	8
Juniata,	1 02	75	35	76	40	4 00	2 25	8 25	9 75	20	4 00	2 75	127	125	27	8
Lackawanna,	1 10	85	52	90	70	6 50	3 25	12 50	15 00	31	4 00	3 50	150	165	35	13
Lancaster,	1 07	80	40	75	86	5 75	3 00	13 00	15 50	31	4 00	4 25	150	140	47	19
Lawrence,	1 00	65	32	77	63	5 10	2 75	9 00	11 25	29	4 10	3 25	125	125	40	6
Lebanon,	1 05	75	36	87	63	4 75	2 50	10 50	13 75	24	4 25	4 25	115	100	30	11
Lehigh,	1 11	75	50	87	51	5 10	3 20	15 00	20 00	26	3 75	3 75	110	125	32	9
Luzerne,	1 10	75	46	82	55	5 75	3 10	12 00	14 75	29	5 75	4 75	140	150	28	17
Lycoming,	1 05	83	50	77	47	5 50	2 75	11 00	14 00	33	4 50	3 75	130	130	36	15
McKean,	1 20	89	65	93	62	6 00	3 00	7 75	9 00	30	3 75	3 25	135	140	33	8
Mercer,	1 02	73	35	86	43	5 00	2 25	7 50	9 75	25	3 87	3 75	140		43	7
Mifflin,	90	65	36	80	45	4 75	2 25	10 00	13 50	27	4 25	4 00	135	135	33	9
Monroe,	1 15	80	47	85	55	6 50	3 25	9 75	12 50	30	3 75	3 25	140	130	30	10
Montgomery,	1 10	90	49	88	90	6 00	3 20	17 50	19 50	40	4 00	3 50	135	100	47	17
Montour,	1 09	87	45	80	50	5 00	3 00	10 00	13 50	32	4 25	3 75	140	140	35	12
Northampton,	1 10	85	47	87	70	5 00	3 00	15 00	13 25	33	4 50	3 50	110	100	40	12
Northumberl'd	1 10	80	43	78	55	4 90	3 20	12 25	15 50	35	4 75	4 25	135	145	35	10
Perry,	1 02	85	39	75	37	4 75	3 25	10 25	12 75	23	3 75	3 50	120	120	33	9
Philadelphia,	1 11	75	50	85	93	5 50	2 95	18 75	21 50	40			187	200	55	20
Pike,	1 07	85	50	82	80	4 25	3 25	11 00	13 50	30	3 75	2 90	123	130	30	12
Potter,	1 20	90	50	87	60	3 75	2 25	7 75	8 75	29	4 25	3 10	130	145	31	13
Schuylkill,	1 12	87	55	85	55	6 50	3 25	17 00	20 00	33	4 00	3 75	140	150	37	17
Snyder,	97	63	42	80	40	4 37	2 20	11 25	14 25	25	5 00	3 75	110	115	30	7
Somerset,	1 13	90	55	86	50	5 00	2 75	9 10	11 75	24	4 75	3 00	120	110	35	8
Sullivan,	1 09	77	47	78	50	5 75	3 25	7 50	10 25	30	4 50	3 25	130	115	30	10
Susquehanna,	1 07	75	50	77	45	4 75	2 75	8 50	10 75	23	3 87	3 25	125	125	30	9
Tioga,	1 12	82	43	90	50	4 75	2 50	7 75	9 75	29	3 90	3 75	120	125	30	11
Union,	1 00	80	40	87	43	5 10	2 80	12 10	14 50	27	5 25	4 75	125		33	8
Venango,	1 07	85	43	86	55	5 25	2 75	9 25	11 75	27	4 25	4 00	120	125	35	10
Warren,	1 06	77	45	78	57	5 10	2 60	9 10	10 50	29	3 75	3 00	130	130	33	10
Washington,	94	75	38	68	43	5 30	2 50	8 50	9 75	28	3 87	3 75	123	135	43	12
Wayne,	1 15	83	46	90	55	5 30	2 80	7 75	9 75	28	4 50	3 15	115	120	28	12
Westmoreland,	99	80	40	78	57	4 50	2 25	10 00	12 25	27	4 00	3 75	127	125	34	9
Wyoming,	1 10	80	45	78	47	5 25	2 75	7 75	9 75	23	4 75	3 75	130	130	30	12
York,	1 01	65	40	70	62	4 87	2 12	12 50	15 10	28	4 00	4 00	150	160	46	11

FARM WAGES AND BOARD, MAY, 1881.

COUNTIES.	By the month, (whole year,) with board.	By the month, (summer months,) with board.	By the day, (with board,) regular work.	By the day, (without board,) regular work.	By the month, (whole year,) without board.	By the month, (summer months,) without board.	By the day, (with board,) transient work.	Estimated cost of board per day.
Adams,	$11 00	$13 75	$0 77	$1 15	$18 00	$21 25	$0 77	$0 42
Allegheny,	15 50	21 00	85	1 20	20 00	24 50	95	48
Armstrong,	11 75	16 00	78	90	18 00	28 50	82	37
Beaver,	13 00	16 50	77	1 00	20 00	25 75	95	47
Bedford,	11 00	14 25	75	1 00	17 00	22 50	80	32
Berks,	10 75	12 75	72	92	16 25	21 50	75	39
Blair,	13 75	16 50	75	1 00	21 50	24 75	75	36
Bradford,	13 15	16 50	72	95	20 25	25 00	85	37
Bucks,	11 75	16 25	85	1 05	18 75	27 50	90	36
Butler,	13 00	16 75	78	1 03	18 00	24 50	85	40
Cambria,	13 75	16 50	87	1 05	18 25	21 50	95	38
Cameron,	14 75	17 75	87	1 10	25 00	22 00	1 00	42
Carbon,	11 00	14 25	67	90	19 25	23 00	75	33
Centre,	11 75	13 75	70	97	17 50	18 50	80	36
Chester,	13 50	14 75	70	1 00	19 00	20 00	75	40
Clarion,	11 75	14 75	85	1 06	20 00	23 75	1 00	34
Clearfield,	13 75	16 75	89	1 00	21 00	23 50	95	40
Clinton,	11 20	13 50	70	87	18 00	20 00	75	35
Columbia,	11 75	12 50	70	1 00	18 75	20 00	75	31
Crawford,	13 25	15 75	75	1 05	18 75	27 00	85	40
Cumberland,	12 15	15 00	65	95	18 50	22 00	75	34
Dauphin,	12 25	14 75	75	98	20 00	25 00	85	37
Delaware,	13 15	15 75	75	1 15	22 25	24 75	90	47
Elk,	15 25	20 00	90	1 20	24 00	26 00	1 00	42
Erie,	14 25	16 25	75	1 00	20 00	23 00	89	45
Fayette,	11 75	14 75	75	1 05	21 75	33 75	87	35
Forest,	14 75	17 75	75	1 05	24 50	27 01	90	45
Franklin,	11 80	13 90	64	83	21 10	23 00	75	38
Fulton,	11 00	13 75	65	92	19 75	21 80	80	31
Greene,	11 25	13 75	60	85	17 50	20 00	75	34
Huntingdon,	11 25	13 25	73	95	18 25	21 75	75	33
Indiana,	11 75	14 25	68	87	23 25	26 70	75	37
Jefferson,	13 75	15 25	80	1 00	25 00	28 00	90	33
Juniata,	11 50	14 00	75	1 00	21 25	23 50	85	35
Lackawanna,	14 10	16 75	82	1 15	23 75	21 75	95	39
Lancaster,	12 00	14 25	75	95	20 75	21 80	85	31
Lawrence,	10 75	13 50	75	1 00	18 50	22 75	90	40
Lebanon,	11 15	13 75	70	1 00	19 00	20 00	80	34
Lehigh,	11 25	13 75	85	1 00	18 75	20 50	90	37
Luzerne,	13 00	16 50	75	1 05	19 75	23 50	85	32
Lycoming,	14 25	17 25	75	1 00	19 75	26 00	85	38
McKean,	13 50	17 50	75	1 05	19 60	26 25	90	40
Mercer,	13 25	16 25	75	1 05	22 75	24 20	85	38
Mifflin,	11 75	14 25	75	1 00	21 50	22 75	80	36
Monroe,	10 25	12 75	65	87	18 00	21 00	70	35
Montgomery,	13 75	17 50	87	1 15	22 75	23 87	90	40
Montour,	12 50	14 87	75	1 00	20 75	22 50	85	30
Northampton,	10 50	12 75	75	1 05	10 00	20 75	87	35
Northumberland,	11 75	13 50	75	1 05	18 50	20 50	80	40
Perry,	10 75	12 50	56	87	17 50	21 00	75	30
Philadelphia,	16 00	19 75	80	1 15	24 75	27 00	1 00	51
Pike,	12 15	14 75	75	1 10	22 00	24 25	80	42
Potter,	13 50	17 25	75	1 00	20 00	22 75	85	40
Schuylkill,	14 00	17 50	75	1 15	23 75	25 00	85	41
Snyder,	11 75	13 50	65	90	21 00	23 50	75	38
Somerset,	11 75	14 00	70	1 00	19 50	21 25	80	40
Sullivan,	12 15	14 75	75	1 05	21 75	23 50	80	41
Susquehanna,	12 10	15 25	80	1 10	23 25	25 40	85	38
Tioga,	13 75	16 50	75	1 00	18 90	20 75	80	37
Union,	11 25	13 75	70	95	18 25	20 25	85	38
Venango,	12 25	14 75	90	1 15	21 00	28 25	1 00	37
Warren,	12 10	16 30	80	1 00	18 25	21 10	90	40
Washington,	13 75	15 80	75	1 00	23 00	25 40	80	35
Wayne,	12 25	15 75	75	1 00	25 00	27 30	82	35
Westmoreland,	13 00	15 50	75	1 10	27 50	29 20	85	45
Wyoming,	13 50	16 25	70	95	24 00	25 00	80	40
York,	10 75	13 75	75	1 00	22 50	24 56	80	42
Averages,	$12 45	$15 49	$0 70	$1 01	$20 08	$23 00	$0 82	$0 40

FARM WAGES AND BOARD, SEASON OF 1882.

COUNTIES.	By the month, (whole year,) with board.	By the month, (summer months,) with board.	By the day, (whole year,) with board.	By the day, (whole year,) without board.	By the month, (whole year,) without board.	By the month, (summer months,) without board.	By the day, (transient work,) with board.	Estimated cost of board per day.	Harvest wages, (with board,) 1881.	Household help, (average,) per week.
Adams,	$9 50	$12 00	$0 57	87	$18 40	$23 20	87	$0 40	$1 37	$1 50
Allegheny,	13 75	22 00	65	$1 00	20 25	25 50	$1 10	47	1 30	2 50
Armstrong,	10 75	14 50	60	95	20 00	23 75	1 00	37	1 27	1 75
Beaver,	16 50	19 50	58	80	20 25	25 00	87	40	1 35	2 00
Bedford,	12 50	15 25	62	87	18 25	23 25	1 00	37	1 20	1 45
Berks,	11 75	14 50	65	80	19 25	21 75	1 00	35	1 10	1 40
Blair,	14 25	18 75	70	92	22 75	25 75	1 00	42	1 25	1 42
Bradford,	15 00	19 25	75	1 05	21 25	24 75	1 00	32	1 50	1 87
Bucks,	14 25	17 75	68	88	21 75	25 00	95	46	1 50	2 00
Butler,	14 25	18 00	75	1 00	20 00	24 50	1 00	37	1 37	2 50
Cambria,	14 50	18 75	65	1 00	24 25	28 75	87	45	1 25	1 87
Cameron,	16 75	19 75	75	1 10	25 80	30 50	1 00	59	1 55	2 50
Carbon,	15 25	20 00	78	1 00	25 20	29 75	1 15	37	1 75	2 25
Centre,	12 75	15 50	75	1 00	21 25	24 30	76	37	1 25	1 55
Chester,	16 25	19 00	75	1 15	23 75	24 80	1 00	40	1 50	1 87
Clarion,	13 50	15 25	78	1 10	16 25	19 75	1 00	40	1 27	1 37
Clearfield,	14 00	16 25	79	1 07	17 10	19 80	95	38	1 50	1 87
Clinton,	16 75	19 25	77	1 09	21 75	29 75	94	40	1 37	2 10
Columbia,	13 25	16 75	75	1 00	23 25	27 75	85	39	1 45	1 75
Crawford,	12 75	15 50	70	80	20 25	24 75	80	33	1 30	1 90
Cumberland,	13 80	15 75	68	78	20 00	25 00	75	36	1 43	1 35
Dauphin,	12 00	14 50	73	95	21 00	25 00	85	47	1 35	1 35
Delaware,	14 75	17 50	75	1 15	23 25	27 75	1 00	50	1 75	2 25
Elk,	16 75	20 00	75	1 10	25 50	28 75	1 00	45	1 35	2 15
Erie,	19 40	17 50	80	1 15	25 00	28 75	95	47	1 30	2 00
Fayette,	15 50	20 00	75	1 05	25 00	28 75	90	45	1 35	1 70
Forest,	14 75	18 75	70	1 00	24 35	27 75	87	42	1 45	2 00
Franklin,	12 50	14 75	70	94	20 50	23 75	80	30	1 50	1 37
Fulton,	12 50	14 25	74	97	20 00	24 25	78	37	1 55	1 73
Greene,	11 75	15 00	62	92	18 75	22 50	70	41	1 25	1 37
Huntingdon,	13 00	16 75	70	1 07	20 00	25 00	77	35	1 35	1 40
Indiana,	14 25	18 00	68	1 05	22 50	26 75	87	47	1 27	1 62
Jefferson,	16 50	20 00	74	1 10	25 50	29 75	95	42	1 25	1 87
Juniata,	11 25	13 75	55	80	17 75	19 50	69	37	1 25	1 35
Lackawanna,	13 75	17 25	76	89	25 00	27 75	87	47	1 35	1 65
Lancaster,	13 50	15 00	67	87	19 75	24 50	80	40	1 37	1 85
Lawrence,	14 50	17 50	70	85	20 00	24 00	90	41	1 37	2 00
Lebanon,	12 75	14 75	70	87	19 50	23 75	84	37	1 50	1 75
Lehigh,	12 87	15 12	72	88	18 75	22 75	80	40	1 37	1 80
Luzerne,	12 25	15 00	75	1 05	25 50	29 75	82	42	1 30	1 50
Lycoming,	14 50	17 75	85	90	24 30	28 75	80	41	1 28	1 75
McKean,	15 25	18 00	78	1 00	25 00	28 00	85	38	1 40	2 00
Mercer,	14 75	18 75	79	96	22 00	25 75	78	42	1 30	1 75
Mifflin,	12 00	14 50	74	95	17 50	19 25	80	39	1 25	1 35
Monroe,	12 50	16 00	65	80	18 25	19 85	76	35	1 50	1 87
Montgomery,	13 75	16 75	80	1 06	21 75	25 00	87	45	1 65	1 70
Montour,	13 50	17 00	75	1 00	21 50	24 75	80	40	1 35	1 75
Northampton,	12 25	14 75	85	1 00	22 00	24 00	90	37	1 45	1 65
Northumberland,	11 25	13 75	75	1 05	18 75	23 50	87	39	1 30	1 50
Perry,	10 25	12 75	62	87	16 75	18 75	75	34	1 25	1 35
Philadelphia,	19 50	22 50	1 00	1 20	30 00	35 00	1 10	55	2 00	2 50
Pike,	15 50	20 00	87	1 05	20 00	25 00	1 00	40	1 50	1 70
Potter,	14 25	18 75	80	90	18 50	19 75	85	38	1 10	1 37
Schuylkill,	15 00	18 00	76	1 10	25 00	29 00	90	45	1 25	1 50
Snyder,	14 25	17 75	74	90	20 00	23 25	80	40	1 20	1 45
Somerset,	11 75	13 75	75	92	18 75	28 50	78	42	1 10	1 75
Sullivan,	14 75	17 80	78	93	18 75	24 75	79	45	1 25	1 80
Susquehanna,	13 00	16 00	80	94	18 00	20 00	80	44	1 25	1 73
Tioga,	14 80	17 80	84	96	19 25	23 75	87	46	1 30	1 80
Union,	12 75	15 00	67	94	18 00	22 00	80	37	1 50	1 35
Venango,	12 50	15 50	72	87	18 50	21 75	74	40	1 37	1 45
Warren,	13 25	15 75	78	87	18 00	22 00	76	42	1 37	1 50
Washington,	14 50	16 00	75	95	20 00	24 00	87	38	1 65	1 85
Wayne,	14 50	15 75	78	96	20 50	24 35	80	39	1 40	1 65
Westmoreland,	15 50	18 00	85	1 05	22 00	25 75	92	37	1 30	1 87
Wyoming,	16 50	18 25	88	94	21 75	24 87	87	39	1 25	1 75
York,	13 00	15 25	78	97	20 00	24 25	78	39	1 45	1 87
Averages,	$13 70	$17 04	$0 75	$0 97	$19 43	$23 47	$0 87	$0 41	$1 39	$1 80

CONDITION OF GROWING CROPS, NOV., 1882.

COUNTIES.	COMPARED WITH LAST YEAR, AS 100.								COMPARED WITH AVERAGE OF PAST FIVE YEARS, AS 100.							
	Wheat, (crop of 1882-3.)	Grass in wheat stubbles.	Clover stubbles, (two years old.)	Timothy stubbles.	Pasture—(natural grasses.)	Pasture—(artificial grasses.)	Rye.	Acreage of wheat, (crop of 1882-3.)	Wheat, (crop of 1882-3.)	Grass in wheat stubbles.	Clover stubbles, (two years old.)	Timothy stubbles.	Pasture—(natural grasses.)	Pasture—(artificial grasses.)	Rye.	Acreage of wheat, (crop of 1882-3.)
Adams,	107	150	110	112	125	130	110	105	100	125	87	106	123	115	107	103
Allegheny,	103	125	120	95	110	110	100	102	100	110	110	110	115	107	102	102
Armstrong,	105	120	110	110	110	105	102	103	104	103	105	105	102	106	100	100
Beaver,	95	107	103	102	103	104	97	104	100	104	103	104	107	107	100	102
Bedford,	100	110	103	105	110	107	85	90	97	100	97	102	105	106	92	90
Berks,	103	134	110	115	125	160	104	100	100	110	115	100	110	110	104	100
Blair,	102	107	110	106	117	103	101	104	101	103	110	107	104	105	100	100
Bradford,	110	147	119	170	150	135	100	106	103	120	110	102	110	107	102	98
Bucks,	100	123	117	120	102	110	100	100	102	112	115	102	112	117	105	100
Butler,	110	121	115	117	107	103	100	106	105	109	107	103	100	102	100	104
Cambria,	100	110	110	120	100	106	100	107	100	106	105	110	100	105	100	105
Cameron,	98	110	100	100	105	105	98	102	100	106	106	100	100	100	100	102
Carbon,	105	150	120	110	125	125	106	100	107	125	125	110	110	100	100	100
Centre,	104	115	110	118	118	104	100	100	105	109	105	105	107	107	100	100
Chester,	100	120	110	108	112	110	100	102	97	109	107	108	110	107	100	105
Clarion,	104	132	115	113	107	114	101	109	103	121	110	110	106	110	102	107
Clearfield,	105	117	110	120	125	130	100	105	110	120	110	110	115	117	100	105
Clinton,	110	110	114	110	117	120	100	108	105	102	102	107	142	117	100	105
Columbia,	115	130	140	130	120	124	107	107	107	120	104	110	117	118	108	107
Crawford,	100	130	184	130	119	117	100	100	107	116	119	112	110	110	100	104
Cumberland,	110	117	140	104	124	117	100	100	107	102	103	100	104	106	100	100
Dauphin,	94	112	114	107	106	107	100	107	96	110	110	105	104	103	100	104
Delaware,	100	117	115	100	106	108	102	103	100	107	100	102	107	109	101	100
Elk,	100	112	111	104	107	108	100	105	100	104	102	103	104	103	100	104
Erie,	102	117	115	105	110	110	102	102	104	109	107	102	107	103	100	102
Fayette,	110	170	150	110	115	117	104	103	110	143	120	107	106	107	102	102
Forest,	91	120	125	130	140	130	102	100	100	110	110	110	110	115	102	100
Franklin,	107	120	110	103	102	104	98	100	100	107	105	100	100	103	101	100
Fulton,	103	114	113	110	110	112	102	104	100	110	107	104	103	105	100	102
Greene,	100	110	120	115	120	120	103	102	100	103	110	110	110	106	102	104
Huntingdon,	97	114	100	110	97	117	96	97	100	107	100	100	104	111	94	103
Indiana,	104	113	121	100	118	119	102	104	110	107	111	103	117	117	102	110
Jefferson,	112	118	112	110	121	119	105	107	103	109	107	107	111	113	104	103
Juniata,	108	130	110	107	114	127	103	105	107	111	110	105	112	120	100	107
Lackawanna,	105	122	120	117	123	120	100	103	100	113	110	112	106	104	100	107
Lancaster,	115	165	125	120	160	165	109	107	102	127	115	110	117	119	104	104
Lawrence,	103	137	115	114	153	137	100	105	109	130	103	104	117	110	100	103
Lebanon,	101	121	106	109	107	109	100	100	100	110	104	103	106	109	100	100
Lehigh,	100	114	117	100	109	111	101	102	100	107	109	100	103	102	100	100
Luzerne,	94	113	105	100	100	100	95	97	100	110	103	100	100	107	102	100
Lycoming,	103	110	107	100	114	115	104	100	99	107	103	100	108	107	100	100
McKean,	100	107	102	107	107	109	100	107	100	100	100	100	104	103	100	109
Mercer,	110	122	114	117	120	120	102	102	103	110	105	107	105	103	101	100
Mifflin,	104	110	110	119	108	107	100	100	102	109	105	105	105	105	102	100
Monroe,	95	107	104	100	97	99	100	104	93	100	100	100	103	104	100	106
Montgomery,	108	135	130	124	127	134	100	102	100	110	135	107	106	108	100	98
Montour,	111	132	140	140	132	117	102	103	106	117	119	120	115	114	100	105
Northampton,	110	117	107	100	106	107	105	110	104	115	110	100	103	104	100	107
Northumberland,	107	147	137	109	175	175	102	104	100	110	111	106	111	114	104	105
Perry.	107	110	110	111	117	109	110	106	104	107	105	109	107	109	100	104
Philadelphia,	113	150	150	130	140	145	110	100	104	121	123	127	134	109	100	95
Pike,	105	119	107	110	121	127	105	105	105	110	107	116	109	111	104	109
Potter,	93	109	104	100	107	109	100	102	100	107	106	102	103	104	100	104
Schuylkill,	107	120	107	103	121	127	108	100	104	117	104	103	111	113	104	100
Snyder,	112	110	110	110	114	109	102	102	105	109	107	109	111	107	100	103
Somerset,	102	106	107	107	102	111	95	102	100	100	111	104	104	102	100	100
Sullivan,	108	110	109	100	107	110	98	102	100	104	102	100	102	104	100	102
Susquehanna,	104	111	113	100	107	109	100	100	100	103	104	100	104	106	100	100
Tioga,	107	107	109	110	110	111	100	100	102	104	107	105	105	107	100	100
Union,	115	125	120	114	127	114	100	100	100	111	107	100	110	107	100	100
Venango,	105	130	127	128	130	140	100	106	104	110	112	120	111	110	100	106
Warren,	105	110	107	105	110	110	105	105	105	107	104	110	110	106	100	107
Washington,	110	115	110	120	130	125	110	101	110	107	110	111	112	113	105	100
Wayne,	107	110	110	114	107	104	104	110	100	104	103	107	104	130	100	107
Westmoreland,	111	120	103	102	110	110	100	105	107	105	102	103	108	107	104	100
Wyoming,	100	107	111	107	114	112	104	98	100	100	102	104	107	105	100	100
York,	114	119	125	107	130	128	104	102	110	109	111	104	111	110	100	100

LIST OF COUNTY AND LOCAL AGRICULTURAL SOCIETIES.

WITH NAMES AND ADDRESSES OF SECRETARIES, WITH DATES AT WHICH FALL FAIRS OF 1882 WERE HELD.

Compiled from official reports and sources, by the Pennsylvania Board of Agriculture.

Those marked with an * are represented in the Board of Agriculture by elected members.

COUNTY.	CORPORATE NAME OR TITLE OF SOCIETY.	NAME AND ADDRESS OF SECRETARY.	WHERE HELD.	WHEN HELD.
	PENNSYLVANIA STATE AGRICULTURAL SOCIETY,	D. W. Seiler, Harrisburg,	Pittsburgh,	September 7-21.
Adams,*	Adams County Agricultural Society,	E. G. Fahnestock, Gettysburg,	Gettysburg,	No fair.
Allegheny,	Fayette Farmers' Club,	J. R. McMichael, Beech Cliff,	Oakdale,	No fair.
Armstrong,*	Armstrong County Agricultural Society,	J. S. Smith, Kittanning,	Kittanning,	September 12-15.
Do.	Leechburg Agricultural Association,	S. S. Blyholder, Leechburg,	Leechburg,	October 3-6.
Do.	Dayton Agricultural and Mechanical Association,	M. L. Thomhurst, Dayton,	Dayton.,	September 26-29.
Do.	Petroleum Agricultural Society,	G. A. Needle, Parker's Landing,	Parker's Landing,	September 26 29.
Beaver,*	Beaver County Agricultural Society,	S. Moody, Beaver,	Beaver,	October 26-29.
Do.	South Beaver Farmers' Club,	J. S. Elder, Darlington,		No fair.
Bedford,	Bedford County Agricultural Society,	J. Amos, Bedford,	Bedford,	September 26-29.
Berks,*	Berks County Agricultural Society,	C. T. Fox, Reading,	Reading,	September 26-29.
Do.	Keystone Agricultural Society,	W. B. Beiber, Kutztown,	Kutztown,	October 3-6.
Blair,*	Blair County Agricultural Society,	F. Jakel, Hollidaysburg,	Hollidaysburg,	No report.
Bradford,*	Bradford County Agricultural Society,	J. A. Wilt, Towanda,	Towanda,	September 27-29.
Do.	Union Agricultural Society,	C. E. Bullock, Canton,	Canton,	October 4-6.
Do.	Troy Farmers' Club,	G. M. Card, Sylvania,	Troy,	September 19-22.
Bucks,	Bucks County Agricultural Society,	W. Wynkoop, Newtown,	Holds no fair,	No fair.
Do.*	Doylestown Agricultural and Mechanical Society,	J. W. Case, Doylestown,	Doylestown,	October 3-6.
Butler,*	Butler County Agricultural Society,	W. P. Roessing, Butler,	Harmony,	September 19-21.
Do.	Connoquenessing Valley Agricultural Society,	L. Reed, Zelienople,	Zelienople,	September 27-29.
Carbon,	Carbon County Industrial Society,	E. Bauer, East Mauch Chunk,	Lehighton,	October 3-6.
Centre,	Centre County Agricultural Society,	S. D. Ray, Bellefonte,	Bellefonte,	No fair.
Chester,	Chester County Agricultural Society,	A. M. Eachus, West Chester,	West Chester,	September 21-23.
Do.	Oxford Agricultural Society,	T. K. Stubbs, Oxford,	Oxford,	September 27-29.
Clarion,	Clarion County Agricultural Society and Driving Park Ass'n,	A. H. Alexander, Clarion,	Clarion.	No fair.
Clearfield,	Clearfield County Agricultural Society,	A. M. Row, Clearfield,	Clearfield,	October 10-13.
Clinton,*	Clinton County Agricultural Society,	W. S. Clawater, Lock Haven,	Lock Haven,	No fair.
Do.	Lycoming and Clinton County Agricultural Society,	D. A. Bingham, Jersey Shore,	Jersey Shore,	September 27-30.
Columbia,*	Columbia County Agricultural Society,	F. B. Hartman, Buckhorn,	Bloomsburg,	October 11-14.
Crawford,*	Crawford County Agricultural Society,	R. B. Myers, Conneautville,	Conneautville,	October 4-6.

LIST OF COUNTY AND LOCAL AGRICULTURAL SOCIETIES—Continued.

COUNTY.	CORPORATE NAME OR TITLE OF SOCIETY.	NAME AND ADDRESS OF SECRETARY.	WHERE HELD.	WHEN HELD.
Crawford,	French Creek Agricultural Association,	D. H. McTate, Cochranton,	Cochranton.	September 13-15.
Do.	Central Agricultural Society,	A. McMichael, Meadville,	Meadville,	No report.
Do.	Oil Creek Valley Agricultural Society.	S. Grumbine, Titusville,	Titusville,	September 19-21.
Cumberland,	Cumberland County Agricultural Society,	L. F. Lyne, Carlisle,	Carlisle,	September 26-29.
Dauphin,*	Dauphin County Agricultural Society,	W. H. H. Sieg, Harrisburg,	Harrisburg,	September 13-16.
Do.	Gratz Driving Park Association,	A. G. Stanley, Lykens,	Gratz,	September 19-22.
Do.	Upper Dauphin Agricultural Society,	M. D. Ferree, Millersburg,	Millersburg,	No report.
Delaware,*	Delaware County Agricultural Society,	H. C. Snowden, Media,	Greenwood,	October 4-7.
Erie,*	Erie County Agricultural Society,	W. P. Edwards, Harbor Creek,	Erie,	September 26-27.
Do.	North-Western Agricultural Association,	D. H. Porter, Corry,	Corry,	October 3-6.
Fayette,	Fayette Agricultural Society,	R. J. Hopwood, Uniontown,	Uniontown,	October 3-5.
Franklin,*	Franklin County Agricultural Society,	C. Gilbert, Chambersburg,	Chambersburg,	No fair.
Fulton,	Fulton County Agricultural Society,	G. A. Stewart, Wells' Tannery,	McConnelsburg,	No fair.
Greene,*	Greene County Agricultural Society,	J. Patterson, Carmichaels,	Carmichaels,	September 28-29.
Do.	Rich Hill Fair Association,	J. T. Goodwin, Ryerson's Station,	Jacksonville,	September 20-21.
Do.	Central Fair Association,	J. D. Lindsey, Waynesburg,	Waynesburg,	No report.
Huntingdon,	Huntingdon County Agricultual Society,	J. R. Patton, Huntingdon,	Huntingdon,	No report.
Indiana,*	Indiana County Agricultural Society,	S. M. Jack, Indiana,	Indiana,	October 3-6.
Jefferson,*	Jefferson County Agricultural Society,	T. L. Templeton, Brookville,	Brookville,	September 19-22.
Do.	Punxsutawny Agricultural Society,	W. P. Hastings, Punxsutawny,	Punxsutawny,	September 26-29.
Juniata,*	Juniata County Agricultural Society,	J. P. Wharton, Port Royal,	Port Royal,	October 4-6.
Do.	Riverside Park Association,	S. B. Lowden, Mifflintown,	Mifflintown,	No fair.
Lackawanna,	Lackawanna County Agricultural Society,	W. H. Silkman, Scranton,	Scranton,	September 26-29.
Lancaster,*	Lancaster County Agricultural Society,	M. D. Kendig, Cresswell,	Lancaster,	No fair.
Do.	Lancaster Driving Park Association,	H. R. McConomy, Lancaster,	Lancaster,	No fair.
Lawrence,*	Lawrence County Agricultural Society,	W. T. Butz, New Castle,	New Castle,	September 14-16.
Do.	Harlansburg Agricultural Association,	W. T. Leathers, Harlansburg,	Harlansburg,	No fair.
Lebanon,*	Lebanon County Agricultural Society,	I. Hoffer, Lebanon,	Lebanon,	No fair.
Do.	Lebanon Valley Agricultural and Mechanical Association,	C. R. Lantz, Lebanon,	Lebanon,	October 4-6.
Lehigh,*	Lehigh County Agricultural Society,	L. P. Hecker, Allentown,	Allentown,	September 27-30.
Luzerne,*	Luzerne County Agricultural Society,	L. Hart, Pittston,	Wyoming,	September 12-15.
Lycoming,*	Lycoming County Agricultural Society,	J. K. Hays, Williamsport,	Williamsport,	September 19-22.
Do.	Muncy Valley Farmers' Club,	W. E. Crawford, Hughesville,	Hughesville.	
McKean,	McKean County Agricultural Society,	A. J. Hughes, Port Allegheny,	Port Allegheny,	September 19-22.
Mercer,*	Mercer County Agricultural Society,	J. P. Hines, Stoneboro',	Stoneboro',	September 25-27.
Do.	West Pennsylvania Agricultural Society,	W. J. McKean, Mercer,	Mercer,	September 6-8.
Do.	Shenango Valley Agricultural Society,	H. H. Lissinger, Greenville,	Greenville,	September 20-22.
Do.	Keystone and Buckeye Agricultural Society,	M. H. Henderson, Sharon,	Sharon,	September 27-30.
Do.	Jamestown Agricultural Society,	W. Gambel, Jamestown,	Jamestown,	No fair.

Mifflin,	Mifflin County Agricultural Society,	S. L. McKinney, Lewistown,	Lewistown,	No fair.
Monroe,	Monroe County Agricultural Society,	T. M. McIlheney, Stroudsburg,	Stroudsburg,	No fair.
Montgomery,*	Montgomery County Agricultural Society,	J. Rex, Upper Dublin,	Ambler Park,	September 26-29.
Montgomery,	Schuylkill Valley Agricultural Association,	A. M. Scheffey, Pottstown,	Pottstown,	No fair.
Do.	Montgomery County and East Penn'a. Agricultural Society,	A. S. Hallman, Norristown,	Norristown,	No fair.
Montour,*	Montour County Agricultural Society,	W. L. Sidler, Kingston,	Danville,	October 4-7.
Do.	Northern Montour Agricultural Society,	C. E. Shires, Washingtonville,	Washingtonville,	October 17-20.
Northampton,*	Northampton County Agricultural Society,	E. T. Grunewald, Nazareth,	Nazareth,	October 3-6.
Do.	Farmers' and Mechanics' Institute,	W. G. Field, Easton,	Easton,	September 12-15.
Northumberland,*	Northumberland County Agricultural Society,	P. H. Moore, Sunbury,	Sunbury,	September 26-29
Philadelphia,	Philadelphia Agricultural Society,	G. R. King, Andalusia,	Holds no fairs,	No fair.
Potter,	Potter County Agricultural Society,	J. M. Correy, Coudersport,	Coudersport,	September 26-28.
Schuylkill,*	Schuylkill County Agricultural Society,	G. H. Yeagher, Orwigsburg,	Orwigsburg,	October 3-6.
Do.	Ringtown Agricultural Society,	I. Applegate, Ringtown,	Ringtown,	September 19-22.
Snyder,	Union Agricultural Society,	M. Wetzel, Selinsgrove,	Selinsgrove,	No report.
Somerset,*	Somerset County Agricultural Society,	J. H. Fritz, Somerset,	Somerset.	No report.
Sullivan,*	Sullivan County Agricultural Society,	E. A. Strong, Dushore,	Dushore,	October 3-5.
Susquehanna,*	Susquehanna County Agricultural Society,	Myron Kasson, Montrose,	Montrose,	September 13-14.
Do.	Harford Agricultural Society,	L. Tiffany, Harford,	Harford,	September 27-28.
Tioga,*	Farmers' Agricultural Society,	J. W. Mather, Wellsboro',	Wellsboro',	September 20-23.
Union,*	Union County Agricultural Society,	C. H. Hassenplug, Lewisburg,	Lewisburg,	October 4-7.
Venango,*	Venango County Agricultural Society,	J. Miller, Franklin,	Franklin.	September 20-22.
Warren,*	Warren Agricultural Association of Warren County,	D. W. Buel, Sugar Grove,	Sugar Grove,	September 12-14.
Washington,*	Washington County Agricultural Society,	A. G. Happer, Washington,	Washington,	October 3-6.
Do.	Chartiers Valley Agricultural Society,	T. M. Potts, Canonsburg,	Canonsburg,	September 26-28.
Do.	Union Agricultural Society,	W. Melvin, Burgettstown,	Burgettstown,	October 3-6.
Do.	Monongahela Valley Agricultural Society,	C. W. Hazzard, Monongahela City,	Monongahela City.	No report.
Do.	Sandy Plains Fair Association,	J. Emery, Millsboro',	Millsboro',	No fair.
Wayne,*	Wayne County Agricultural Society,	T. J. Ham, Honesdale,	Honesdale,	No report.
Westmoreland,	Westmoreland County Agricultural Society,	J. S. Ulty, Greensburg,	Greensburg,	No report.
Wyoming,	Wyoming County Agricultural Society,	J. W. Piatt, Tunkhannock,	Tunkhannock,	September 20-22.
Do.	Nicholson Agricultural Society,	N. P. Wilcox, Nicholson,	Nicholson,	September 7-8.
York,*	York County Agricultural Society,	E. Chapin, York,	York,	October 3-6.
Do.	York Horticultural and Industrial Association,	F. Geise, York,	York,	No fair.

TABULATED ANALYSES OF FERTILIZERS ISSUED BY THE PENNSYLVANIA BOARD OF AGRICULTURE.

Analyses by Prof. F. A. Genth, University of Pennsylvania, and Chemist of the Board of Agriculture, from samples selected by the Secretary of the Board, or by its duly appointed agents, in accordance with the provisions of the act of June 28, 1879. All samples here given are verified by oath or affirmation, on file in the office of the Board of Agriculture. The valuations given are by Prof. F. A. Genth, and are based upon soluble and reverted phosphoric acid at 10 cents per pound; insoluble phosphoric acid from bone, 6 cents per pound, and from acidulated S. C. rock at 4 cents per pound; potash at 6 cents per pound, and ammonia at 17½ cents per pound.

Record number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER	WHERE SELECTED.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Ammonia.	Estimated commercial value per ton.	Selling price per ton at point of selection.	Record number.
183	Eckenrode's Phosphate,	T. H. Eckenrode, Taneytown, Md.,	New Cumberland,	6.59	1.82	2 01	2.84	2 11	30 03	38 00	183
184	Avondale Phosphate,	G. Ober & Sons, Baltimore, Md.,	Dillsburg,	8.29	1.98	1.32	1.83	2 17	31 92	38 00	184
185	Commonwealth Phosphate,	William Clark & Co., New York,	Dillsburg,	1 61	5 87	7.36	1.18	2.15	32 74	32 00	185
186	Sangston's Plant Food,	Maryland Fertilizer Company, Baltimore, Md.,	Dillsburg,	7.30	3.35	3.19	2 45	1.85	32 27	35 00	186
187	Acid Phosphate,	Maryland Fertilizer Company, Baltimore, Md.,	Dillsburg,	6 50	3.79	2 42	1.23		23 80	30 00	187
188	Zell's Economizer,	P. Zell & Sons, Baltimore, Md.,	Dillsburg,	9.24	2.19	0.52	1 60	1.90	31 83	34 00	188
189	Americus Phosphate,	Williams, Clark & Co., New York,	Dillsburg,	7.06	3 87	2.50	1 60	3.07	36 53	39 00	189
190	Universal Phosphate,	Williams, Clark & Co., New York,	Dillsburg,	8.35	1.27	1 23	2 08	2.46	31 27	35 00	190
191	Improved Bone Phosphate,	J. A. Hartman, Cambria, Pa.,	Cambria,	3.54	4.56	3.03	0 86	1.25	24 58	33 00	191
192	Button Bone,	H. Cope, Lincoln University, Pa.,	Lincoln University,	. .	. . .	24.74	. .	4.40	45 09	38 00	192
193	Pure Ground Bone,	H. Cope, Lincoln University, Pa.,	Lincoln University,			21.43	. .	4.39	43 19	33 00	193
194	Lister's Standard Phosphate,	Lister Brothers, Newark, N. J.,	York,	10.17	1.92	1.60	1.48	3.47	40 03	37 00	194
195	Lister's Ammoniated Phosphate,	Lister Brothers, Newark, N. J.,	York,	9 15	2.60	2.19	1.63	3.19	39 32	35 00	195
196	Lister's United States Phosphate,	Lister Brothers, Newark, N. J.,	York,	5.49	1.97	1.06	3 89	1 73	26 92	31 00	196
197	Wahl Brothers' Ground Bone,	Wahl Brothers, Chicago, Ills.,	York,			23 59		4 27	43 28	40 00	197
198	Kainit,	Kerr, Brother & Co., Baltimore, Md.,	York,				13.79		16 55	16 00	198
199	Star Bone Phosphate,	J. E. Tygert & Co., Philadelphia, Pa.,	York,	4.32	4.48	1.57	2.21	1.72	29 15	38 00	199
200	Swift Sure Phosphate,	M. L. Shoemaker & Co., Philadelphia, Pa.,	York,	5.53	6.45	3.37	3.19	3 64	44 57	38 00	200
201	Champion Bone Phosphate,	Susquehanna Fertilizer Company, Oxford, Pa.,	York,	6.26	5 43	2.02	1.60	1.53	32 27	40 00	201
202	Whann's Raw Bone Phosphate,	Walton, Whann & Co., Philadelphia, Pa.,	York,	7.84	2 13	2.72	2.75	2.80	35 22	33 00	202
203	E. Frank Coe's Phosphate,	Coe & Richmond, Philadelphia, Pa.,	York,	10.07	2.56	0.42	0.19	3.31	37 53	33 00	203
204	Ground Bone,	S. R. Dickey & Co., Oxford, Pa.,	Oxford,	.	. .	21.88	. . .	5.30	44 31	33 00	204
205	Pure Raw Bone,	W. D. Alexander, Oxford, Pa.,	Oxford,	. .	. .	22.46	. . . .	4.81	43 79	37 00	205
206	Ground Bone,	J. Cope & Co., Lincoln University, Pa.,	Oxford,	. . .	. . .	23.03	. . .	4 64	43 74	40 00	206
207	St. Louis Bone,	Susquehanna Fertilizer Company, Oxford, Pa.,	Oxford,	.		21.49		4.59	41 86	37 00	207
208	Bollinger & Fry's Phosphate,	Bollinger & Fry, Seitzland, Pa.,	Glen Rock,	4.00	4.52	2 69	1.14	1.84	28 08	38 00	208
209	Challenge Phosphate, (old sample,)	English manufacture,	Harrisburg,	21.63	5.75	2.26	. . . . .	. . .	55 37	60 00	209

210	Complete Manure,	H. Cope, Lincoln University, Pa.,	Oxford,	3.66	2.97	0.91	3.44	1.67	32 77	35 00	210
211	Complete Bone Manure,	Allentown Manufacturing Co., Allentown, Pa.,	Allentown,	2.39	4 95	3.10	0.21	2.04	25 79	30 00	211
212	Complete Bone Phosphate,	Allentown Manufacturing Co., Allentown, Pa.,	Allentown,	5.31	4.63	1.53	2.08	2.16	31 70	35 00	212
213	Ground Bone,	Dempwolf & Co., York, Pa.,	York,	. .		21.03	. .	5.33	43 96	33 00	213
214	Button Bone,	Dempwolf & Co., York, Pa.,	York,			23 26		4 89	45 03	40 00	214
215	Raw Bone Phosphate,	Dempwolf & Co , York, Pa.,	York,	3.43	3.51	0.70	0.12	3.80	38 16	44 00	215
216	Acid Phosphate, (S. C. Rock,)	Waring Manufacturing Company, Colora, Md.,	Oxford,	9.74	4 08	2 27	. . .	. . . .	29 46	25 00	216
217	Acid Phosphate, (S. C. Rock,)	Susquehanna Fertilizer Company, Oxford, Pa.,	Oxford,	6.92	6.42	2.42	.	.	23 62	26 00	217
218	Eastern Shore Domestic Guano,	F. H. Nickerson & Co., Easton, Md.,	New Cumberland,	5.23	4.87	1.51	2 28	0.97	27 83	33 00	218
219	Standard Bone Phosphate,	Hubbard & Bro., Easton, Md.,	New Cumberland,	6 61	4.17	2.96	2.43	2.49	36 75	35 00	219
220	Grass, and Spring top Dressing,	Mapes Formula Company, New York,	New Cumberland,	3.53	3.96	2.57	6.36	4 39	39 05	52 00	220
221	Mapes' Complete Manure,	Mapes Formula Company, New York,	New Cumberland,	5.06	4.69	5 39	2.76	2 24	37 22	42 00	221
222	Mapes' Potato Manure,	Mapes Formula Company, New York,	New Cumberland,	5 77	3 72	1 87	5.50	4.90	44 97	57 00	222
223	Pure Bone Phosphate,	A. Ainstine. Stewartstown, Pa.,	Glen Rock,	4.27	3.00	4.23	1.92	2.92	32 12	35 00	223
224	Goodwin's Excelsior Phosphate,	Rowland & Tompkins, Fox Chase, Pa.,	Avondale,	4.27	3.13	0.84	2.39	2.43	27 18	33 00	224
225	Dissolved S. C. Rock,	Coe & Richmond, Philadelphia,	West Chester,	11.84	4.05	1.23	.	. .	32 76	25 00	225
226	Star Bone Phosphate,	J. E. Tygert & Co., Philadelphia,	Philadelphia,	6.03	4.53	2.26	2.77	3.44	33 69	37 00	226
227	New Jersey Marl,	New Jersey,	Avondale,	.	. .	1.38	0.75	.	2 00	7 00	227
228	Star Bone,	J. E. Tygert & Co., Philadelphia,	Philadelphia,	.		25.05		4.92	47 28	40 00	228
229	Soluble Pacific Guano,	Soluble Pacific Guano Company, Boston,	Harrisburg,	9.33	3.38	2 23	0.49	2 80	37 80	35 00	229
230	Star Guano,	J. E. Tygert & Co., Philadelphia,	Philadelphia,	5.23	2.68	1.35	3.20	3.45	34 56	37 00	230
231	Corn and Oats Fertilizer,	Lorentz & Rittler, Baltimore, Md.,	Relay,	5.16	4 34	1 96	1.61	2.37	30 80	34 00	231
232	Truckers' Triumph,	J. E. Tygert & Co., Philadelphia,	Philadelphia,	6.22	1 03	0 17	3.80	6.40	41 66	53 00	232
233	Pure Ground Bone,	J. Schaal. Erie, Pa.,	Erie,			21.13		4.64	41 60	36 00	233
234	Pacific Guano,	Glidden & Curtis, Boston,	Erie,	6.51	4.63	2.82	1.06	2 64	34 65	45 00	234
235	Superphosphate,	Jarecki Chemical Company, Erie, Pa.,	Erie,	3.20	6.44	4.94	2.41	2.47	36 75	31 00	235
236	Honest Buffalo Phosphate,	L. L. Crocker & Co., Buffalo, N. Y.,	Erie,	3.56	4.15	4.06	0.99	3 81	34 82	34 00	236
237	Newport's Rectified Phosphate,	W. C. Newport & Co., Willow Grove, Pa.,	Carversville,	6.22	6.56	2.21	6.34	2.41	43 82	42 00	237
238	"A B" Phosphate,	W. Kenderdine, Lumberville, Pa.,	Carversville,	5.07	5.18	3.98	2.91	1.72	33 19	35 00	238
239	Schaal's Phosphate,	J. Schaal, Erie, Pa.,	Erie,	3.35	4.68	2.00	1.94	2.86	30 80	32 00	239
240	Ground Bone,	Jarecki Chemical Company,	Erie,			22.34		5.01	44 35	35 00	240
241	Superphosphate,	Chappell & Sons, Baltimore, Md.,	Relay,	6.65	2.20	2.20	2 25	2 88	32 24	34 00	241
242	Soluble Flour of Bone,	Chappell & Sons, Baltimore, Md.,	York,	6.84	3.48	2.72	1.12	2.71	31 63	33 00	242
243	Swift Sure Phosphate,	M. L. Shoemaker & Co., Philadelphia, Pa.,	Shermansdale,	7.45	4.08	2.46	4.47	3.83	44 68	40 00	243
244	Raw Bone Meal,	Whann & Armstrong, Landenburg, Pa.,	Landenburg,			21.24	. .	4 11	39 36	33 00	244
245	Acid Phosphate, (S. C. Rock,)	Walton, Whann & Co., Wilmington, Del.,	Landenburg,	12.80	0.09	3.53	. . .	. . .	23 44	26 00	245
246	Acid Phosphate, (S. C. Rock,)	Bowker Fertilizer Company, New York,	Gap,	10.03	5.14	2.97			32 72	25 00	246
247	Hill and Drill Phosphate,	Bowker Fertilizer Company, New York,	Ephrata,	6.68	3.35	3.36	3.72	2.62	33 17	40 00	247
248	Dissolved Bone Phosphate,	Bowker Fertilizer Company, New York,	Ephrata,	4.61	2.82	4.93	1.23	2.50	30 03	36 00	248
249	Globe Fertilizer,	Haller, Beck & Co., Pittsburgh, Pa.,	Pittsburgh,			0.02	0.14	0.04	46	12 00	249
250	Ammoniated Phosphate,	Chappell & Sons, Baltimore, Md.,	York,	7.87	2.14	1.91	1.35	2.69	32 50	37 00	250
251	Twenty-five Dollar Phosphate,	Baugh & Sons, Philadelphia, Pa.,	Lock Haven,	5.12	2.27	3.30	0.22	2.09	26 32	29 60	251
252	Ammoniated Superphosphate,	Tyson & Son, Frederick, Md.,	Lock Haven,	7.04	2.25	4 42	2.06	1 85	31 07	33 00	252
253	Economical Fertilizer,	Baugh & Sons, Philadelphia, Pa.,	Lock Haven,	4 39	2.00	2.05	2.70	1 85	24 96	34 00	253
254	Acid Phosphate, (S. C. Rock,)	Baugh & Sons, Philadelphia, Pa.,	Lock Haven,	6.18	5.04	6.13			27 34	29 60	254
255	Muriate Potash,	Mapes Formula Company, New York,	West Grove,	. . .	.	. . . .	59.97		71 96	40 00	255
256	Sulphate Ammonia,	Mapes Formula Company, New York,	West Grove,		.	. . .	. .	25.70	89 95	100 00	256
257	Dissolved Bone Phosphate,	Sharpless & Carpenter, Philadelphia, Pa.,	Lebanon,	3.83	4.88	2.01	1.72	1.84	27 53	36 00	257
258	Exchange Guano,	Parks & Co., Baltimore, Md.,	Lebanon,	7.53	2 49	0.73	2.05	1.66	28 89	35 00	258
259	Bone Phosphate,	Pierson & McDowell, Oxford, Pa.,	Avondale,	1.27	4.67	3 07	1,53	0.99	20 87	34 00	259
260	Acid Phosphate,	N. J. Chemical Co., Philadelphia, Pa.,	West Grove,	6.58	5.19	4.32	. .	. . . .	27 00	25 00	260
261	Dissolved Bone Black,	Mapes Formula Company, New York,	West Grove,	11.59	0.07	0 31	0.27	0.74	26 60	31 50	261
262	T. & P. Acid Phosphate,	Waring Manufacturing Company, Colora, Md.,	West Grove,	9.81	3.26	3.74	. . . .	. . . .	29 13	24 00	262

TABULATED ANALYSES OF FERTILIZERS—Continued.

Record number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	WHERE SELECTED.	Soluble phosphoric acid.	Reverted phosphoric acid.	Insoluble phosphoric acid.	Potash.	Ammonia.	Estimated commercial value per ton.	Selling price per ton at point of selection.	Record number.
263	Philadelphia Standard Phosphate,	U. S. Chemical Company, Philadelphia, Pa.,	Kennett Square,	12.23	3.31	2 14	. . .	. . .	$32 79	$25 00	263
264	Ground Bone,	J. Gawthrop, & Co., Kennett Square,	Kennett Square,			20.47	. .	5.05	42 06	33 00	264
265	Bone and Potash Phosphate,	J. Gawthrop, & Co., Kennett Square,	Kennett Square,	2.60	4.90	1.89	6.79	0.76	23 12	35 00	265
266	**Baker's Standard Guano,**	Chemical Company of Canton, Md.,	Chambersburg,	4 52	3.29	5.49	1.14	2.51	30 17	35 00	266
267	**Acid Phosphate,**	Moro Phillips, Philadelphia,	Chambersburg,	7.47	6.06	4.69			30 81	28 00	267
268	Colgate Manure,	Chemical Company of Canton, Md.,	Chambersburg,	6.56	3 43	5 03	2.40	1.62	32 59	35 00	268
269	Acid Phosphate,	Maryland Fertilizer Company, Baltimore, Md.,	Millvale,	8.51	2 43	1.98	1.33		25 02	28 00	269
270	Alkaline Bone,	Maryland Fertilizer Company, Baltimore, Md.,	Millvale,	8.97	2.97	2.03	2.74	0.17	29 39	32 00	270
271	Ground Raw Bone,	W. D. Alexander, Oxford, Pa.,	Toughkenamon,		. .	21.85		4.71	42 71	38 00	271
272	E. Frank Coe's Phosphate,	Coe & Richmond, Philadelphia, Pa.,	Toughkenamon,	9.47	1.45	0 95	0.44	3.18	34 64	38 00	272
273	Ground Bone,	Bollinger & Fry, Seitzland, Pa.,	Harrisburg,			21.65		4.44	41 52	38 00	273
274	**Ammoniated Bone Phosphate,**	Bollinger & Fry, Seitzland, Pa.,	Harrisburg,	4.54	3.91	2.60	1.87	1.72	23 28	38 00	274
275	**Hess' Phosphate,**	D. D. Hess & Son, Reading, Pa.,	Reading,	5 07	2.23	1.55	1 64	1.31	23 12	38 00	275
276	Cumberland Co. Fertilizer, Grade A,	Brandon & Co., Carlisle, Pa.,	Carlisle,	0.13	1.06	0.40	0.89	0.33	5 05	20 00	276
277	Raw Bone,	Brandon & Co., Carlisle, Pa.,	Carlisle,			24.02		4 31	43 91	50 00	277
278	Cumberland Co. Fertilizer Grade C,	Brandon & Co., Carlisle, Pa.,	Carlisle,	1.62	4.20	0.96	2.74	3.48	29 26	25 00	278
279	Forest City Phosphate,	Cleveland Dryer Company, Cleveland, Ohio,	Darlington,	7.46	3 70	2.66	0.23	2.88	35 91	40 00	279
280	Smoky City Phosphate,	J. & R. Young, Pittsburgh, Pa.,	Darlington,	1.91	4.57	2 47	3.88	1.19	24 75	35 00	280
281	Schilling's Premium Bone,	Excelsior Fertilizing Company, Alliance, Ohio,	Darlington,			23.05		5.03	45 26	45 00	281
282	Homestead Nitro-Phosphate,	F. H. Souder, Souderton, Pa.,	Kulpsville,	3 36	5.68	3.68	1.03	2.42	32 18	37 00	282
283	Homestead Phosphate,	Michigan Carbon Works, Detroit, Mich.,	Cedar Springs,	9.04	1.36	0.40	0.75	2.56	31 14	30 00	283
284	Ammoniated Dissolved Bone,	Ames, Lecron & Co., Waynesboro', Pa.,	Altenwald,	1.30	5 53	3 94	7.84	4.92	44 59	39 00	284
285	Unchallenged Bone Phosphate,	Ames, Lecron & Co., Waynesboro', Pa.,	Altenwald,	0.13	4.57	8.58	5.00	3 36	37 46	35 00	285
286	Bone Phosphate,	Ames, Lecron & Co., Waynesboro', Pa.,	Altenwald,	0 79	6.66	4.57	3.50	1.78	30 81	28 00	286
287	Acid Phosphate,	Walton, Whann & Co., Wilmington, Del.,	Landenburg,	9.97	5 50	1.19			31 89	24 00	287
288	Keystone Raw Bone Phosphate,	Whann & Armstrong, Landenburg, Pa.,	Landenburg,	5.07	4.02	2.86	1.15	1.08	26 60	35 00	288
289	Chester Valley Phosphate,	W. E. Whann, Atglen, Pa.,	Bird-in-Hand,	4.39	4 78	2 90	1.92	1.54	29 41	36 00	289
293	Zell's Dissolved Bone Phosphate,	Zell & Sons, Baltimore, Md.,	Lancaster,	9.38	3.82	0.82			27 06	28 00	293
294	Lobo's Peruvian Guano,	Peruvian Guano Company, New York,	Lancaster,	1.17	8.64	7.18	4.00	6.22	54 81	65 00	294
295	Guaranteed Peruvian Guano,	Peruvian Guano Company, New York,	Lancaster,	2.15	13.33	3.53	3.01	6.58	61 17	72 00	295
296	Oriole High Grade Phosphate,	Symington Bros. & Co., Baltimore, Md.,	Gettysburg,	5.40	1 33	0.15	3.27	1.96	24 43	33 00	296
297	Oriole Ammoniated Bone Phosphate,	Symington Bros. & Co., Baltimore, Md.,	Gettysburg,	9.50	4 37	0.48	0.47	0.78	31 41	36 00	297
298	Oriole Acid Phosphate,	Symington Bros. & Co., Baltimore, Md.,	Gettysburg,	8 25	4.25	0.68	1.01		26 75	28 00	298
300	Tip Top Raw Bone Phosphate,	J. P. Thomas, Cheney, Pa.,	Barneston,	7.14	6 12	3 12	0.74	1.45	34 24	33 00	300
301	**Robinson's High Grade Nitro Phosph.,**	C. A. Robinson, Rockville, Pa.,	Barneston,	5.02	4.13	4 23	0.11	1.97	30 41	36 00	301

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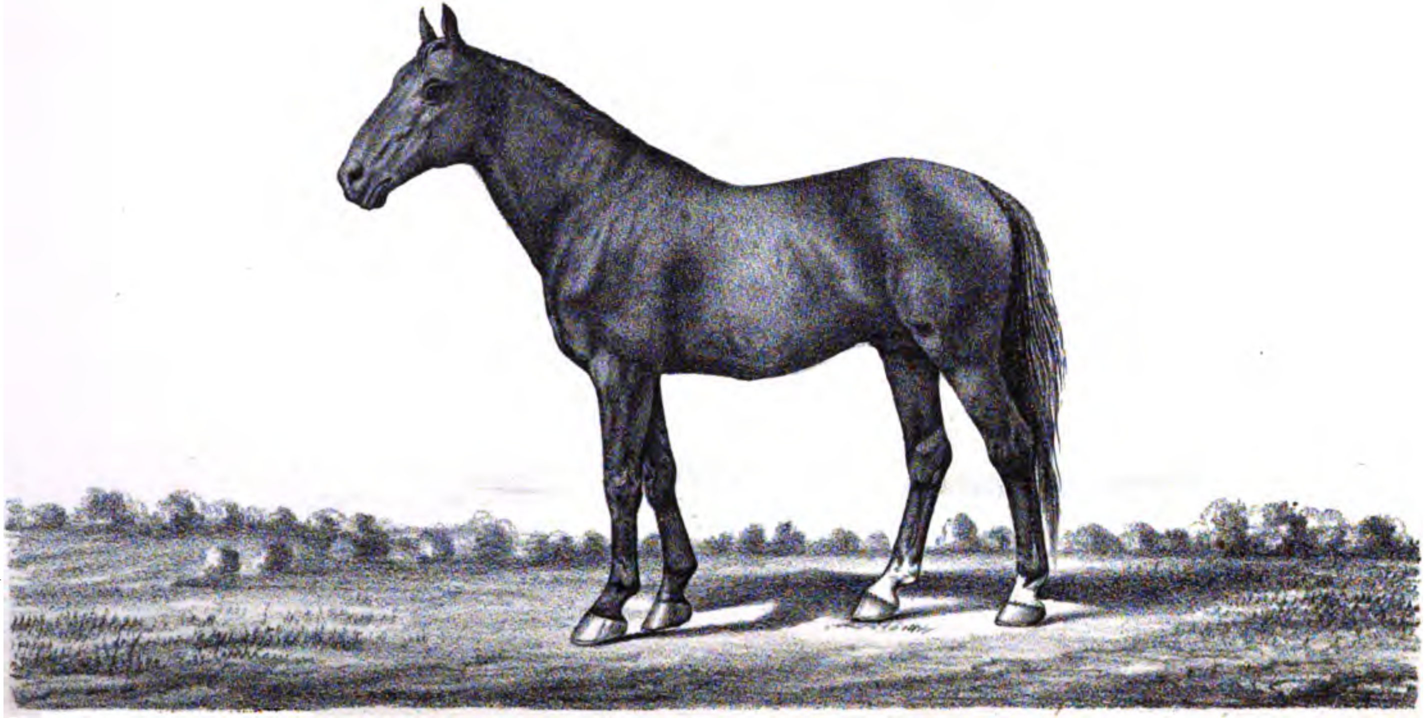

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MINUTES OF THE TRANSACTIONS

OF THE

PENNSYLVANIA

STATE AGRICULTURAL SOCIETY,

1881-82.

PROCEEDINGS OF THE EXECUTIVE COMMITTEE.

HARRISBURG, *January 17, 1882.*

The meeting was called to order. In the absence of President Bissell, John G. Morris was called to the chair.

The proceedings of the last meeting were read and approved.

The following officers were present: Branson, Holstein, Barto, Neiman, Tripp, Keller, Miller, Gehr, Mackey, Rhey, Murdoch, Speer, McDowell, Miles, Wilhelm, Abner Rutherford, Taggart, Haldeman, Kapp, Morris, Eby, Kennedy, Egle, J. B. Rutherford, McConkey, and Seiler.

Letters from Messrs. Blight, Tasker, and Kirkpatrick, regretting their inability to be present, were read.

Mr. KENNEDY, chairman of the Committee on Publication, presented the following report:

HARRISBURG, *January 17, 1882.*

To the President and Members of the Pennsylvania State Agricultural Society:

GENTLEMEN: Your Committee on Publication has the honor to report that the printing of your volume of transactions for 1881 has been completed, and that the work is in the hands of the binder. Included in the volume, will be found that portion of the report of the International Exhibition of Sheep, Wool, and Wool Products, which was crowded out of the issue of last year.

The editing of these reports was the more onerous because of the circumstances which attended their preparation. Especially was this the case with the reports on Merinoes. The jury on that division had two reporters, neither of whom, it would seem, had cognizance of what the other had written; nor were the reports entirely free from the spirit of acrimony engendered by the unfortunate disagreement about the Merino flocks.

As it has been the uniform practice of your Society to quench such a spirit and to condense publications of reports, these in question were necessarily abridged, a duty which has been performed with a full realization of its delicacy. No reports on Middle Wool sheep accompanied the awards of the jury on that division, an omission the more to be regretted because the Southdown and Oxforddowns were of surpassing excellence, and some of them, from England, had already won prizes in sheep contests there.

The reports of the juries of awards at the late exhibition of your Society, at Pittsburgh, are by no means so full as is necessary in order to an understanding of the motives which influenced their decisions. Exhibitors like to have the reasons assigned for the awards which they receive, and these would be more generally stated by the juries were they furnished with printed blanks, containing proper headings for the purpose. Blanks prepared in a form to facilitate the labors of the juries would be an accommodation to them as well as to the exhibitors, and your committee recommends that the forms be in readiness to be used at all future exhibitions of your Society.

The reporters of the Pittsburgh press did not imitate their Philadelphia brethren and compete for the Society's prize for the best report on the exhibition, published in a newspaper or furnished in manuscript. Nor, except that on live stock, including the Collie trials by Dr. L. H. Twaddell, was any report on the departments of the exhibition furnished by a superintendent. Hence, comparatively few pages of the volume are required for that report.

As your exhibition has so far outgrown their former proportions as to be the best annual exponent of the advance of American agriculture, the improvements shown should be fully and accurately described, and the report thus becomes a history of the progress of the farmer's art.

Competition for the Society's prize for essays has again became active, and able papers have been presented. Awards have been made to two of the authors. To H. E. Stockbridge, Amherst, Massachusetts, for his essay (premium list, No. 1622) on "Agricultural Experimental Stations and the Methods of Conducting them most Effectively for the Advancement of the Farmer's Art and Science," in which he insists that every such station shall have an experimental farm attached. Also for his essay (premium list, No. 1621) on the "Most Effective Methods by which the District Schools may be made to diffuse Knowledge of Correct Agricultural Principles and Practice among the Families of which the Pupils are Members." No prize for an essay on this subject has, it is believed, ever before been offered, and the author's treatment of it, presents suggestions as valuable as they are moral.

For an elaborate essay on "Forestry in Europe and America," a subject just now attracting much attention, written by Prof. J. T. Rothrock, of Philadelphia, a special prize has been awarded. A short essay on the "Improvement of Villages," by Mr. James Dell, of Pittsburgh, also appears in your volume, which contains only about one hundred and fifty pages, instead of two hundred, previously required. This deficiency of nearly fifty pages, partially accounted for above, ought not to be allowed to exist in future. Nor need it exist if your Society will provide, as all other States provide, for a series of appropriate literary exercises at its annual meeting. These exercises may very properly consist of a formal address by the President, one or more lectures on the science of the farm, papers on practical subjects, and discussions on them to be opened by persons previously designated. Section one of your constitution, reads thus: "The officers of county agricultural societies in this State, or delegations therefrom, shall be members, *ex-officio*, of this Society." Let these officers or delegations be invited to attend the annual meetings and take part in some of the exercises just indicated. Notices of the meeting, containing programme of the exercises, circulated in advance, would aid in securing a large attendance and increase the value of the information brought out. No more acceptable than this need be devised, and its quantity may be augmented to the full capacity required for the volume.

In conclusion, your committee beg to present for your favorable consideration the following resolutions:

Resolved, That the reports of juries of awards at the Society's exhibitions be accompanied by statements of the motives which influenced their awards.

Resolved, That the exercises at the January meeting of this Society shall include an address by the President, the reading of essays on topics previously selected and assigned to members competent to treat them, and discussions on some subjects of agricultural interest.

Resolved, That invitations be extended to the officers of the county agricultural societies, or delegations therefrom, to attend the annual meetings of the Society, and to participate in the proceedings.

Respectfully submitted,

ALFRED L. KENNEDY,
Chairman.

Mr. **EGLE** moved that the report be adopted.

Mr. **HALDEMAN** moved to amend by striking out the words, "motives that influenced their awards."

Mr. **KENNEDY**. I think the word motive is a proper one, and was used and a precedent made by those controlling the Centennial Exhibition. The word shows the reason or cause influencing the awards. When I see an award made to Wood one year, Osborne one year, and to another the next year, I want to know what influenced these decisions. I follow precedent. If we can make these reports valuable, it must represent the progress in agriculture in this country. As for myself, I desire to see them in print.

Mr. **TAGGART**. Awards should not be founded on motives, but a statement of the reasons which influenced awards should be given. I, therefore, move to substitute "reasons" for "motives."

Mr. **McDOWELL**. This does not meet with my approbation. The report just read refers to the sheep committees. The reason why no report was made, was that Mr. Garland, one of the jury, was not paid for this particular duty.

Mr. **WILHELM**. I think the resolution should be adopted.

Mr. **MILES**. I think the printing of the blanks will be a useless expenditure of money, and, in many cases, it is impossible to say where the line of discrimination may be drawn.

Mr. **KENNEDY**. We have a jury of awards. Why? Because there is a difference in all things, and, for this alone, a jury is selected to discriminate on the points of excellence or demerits of either stock or machinery. These exhibitions are intended to point out to the public, for their good and information, these distinctions.

Mr. MILES moved to amend by striking out the whole resolution.

Not agreed to.

The amendment to insert the word reasons for motives was agreed to.

Mr. SEILER moved to amend as follows: "That the subjects selected for discussion shall be agreed upon by the President and the Committee on Publication, and assignments made to the several members of the committee be made by the same.

Agreed to.

Mr. BRANSON, one of the committee appointed at the September meeting to distribute premium seeds purchased at the exhibition of this Society, reported as follows:

Memorandum of Wheat in Test on account of the Pennsylvania State Agricultural Society, planted October 3, 1881.

Plots.	*No. lbs.*	*Varities of wheat.*	*By whom furnished.*
1	13	Foster's Foltz,	Foster.
2	13	Martin's Amber,	Martin.
3	13	Roger's White,	Branson.
4	13	Subble Red,	Boyer.
5	13	Branson's Imported Red,	Branson.
6	13	Virginia Red,	Boyer.

The above samples were all selected from premium wheat at our recent exhibition at Pittsburgh, and gratituously furnished your committee by the exhibitors of the same. Owing to the continued drought in Chester county last fall, it was not deemed proper to plant earlier than the time above mentioned.

The ground being first thoroughly pulverized, six hundred pounds Hoeveler's raw-bone meal and phosphoric acid and potash fertilizer was applied to the acre, broadcast and in drill. The different varieties of wheat are all promising an abundant yield thus far. In addition to the above, three other varieties of wheat have been kindly furnished your Chester county member of the committee.

One variety, the "Dallas Wheat," from the Department of Agriculture at Washington, by the Hon. William Ward; Landreth & Sons, of Philadelphia, a very fine sample of "Golden Grain;" also a very superior wheat, known as the "Brittainy," was presented by Mr. Hiram Russell, of Valley township, Chester county. The last three varieties named are in a different test, with about six hundred pounds Whann's phosphate applied to the acre, broadcast and in drill.

All of which is respectfully submitted,

DAVID H. BRANSON,
Chester County Member of Committee.

Mr. BRANSON. Mr. President, the efforts made by this Society in this direction are highly appreciated by our Chester county farmers. If successful in our work, the benefits can scarcely be estimated. The plots are arranged as agreed upon by our committee. Many farmers that have examined our work, are under the impression that it will result favorably, and are anxiously watching with interest when we make our final report. You will remember that this Society at Pittsburgh, appointed a committee for the purpose of testing the relative merits of the different cereals in season. We have had encouraging reports from this committee—the promise of an abundant yield from the different plots of wheat now under cultivation in the five counties—Allegheny, Washington, Columbia, Westmoreland, and

Chester, and hope that this Society will continue to render every possible aid, in order that this committee may be enabled to carry out to the fullest extent the object in view.

And as the season is now at hand it will require some immediate action as to how and what varieties of seeds shall be procured for the coming spring crops—such as corn, oats, potatoes, &c. As we have not adopted any plan how seeds shall be procured at this early stage of our new departure, I would suggest, however, for the spring planting for 1883, there be an exchange of seeds by the committee.

The suggestion of Mr. Branson was agreed to.

Mr. McDOWELL, from same committee, reported as follows: "I fully recognize the importance of the advance step taken by this Society. The object of this Society is not only to place on exhibition samples of the cereal crops raised in the State, but to encourage the growing of the best and most productive kind of grain. Therefore the plan proposed and now being carried out, of making actual tests of the different varieties of wheat in the different counties of the State, and making reports of these actual tests, together with samples of the product, to be placed on exhibition at our annual fairs, giving the method of culture and the fertilizers used, will result with untold benefit to the grain-grower, as well as to the consumer.

There is a science in grain growing not fully understood, that the actual tests may discover. Why is it that the same variety of seed, brought from a distant part of the State, will do better for seed than that of the same variety which has been sown year after year in the same locality?

There is a science in growing the cereals, as well as a science in the breeding of our best stud flocks of sheep or other stock. By these actual tests, under the auspices of our State Society, we may increase not only the yield, but the size and plumpness of the berry. Can not corn be improved for seed, by making a specialty of growing it expressly for seed? Say, for instance, you plant in hills four feet apart, two stocks to the hill, using seed from the center of the ear, and rejecting all others, giving it advantage of good soil and the best of fertilizers, cutting down or topping off all small stocks, so that the pollen from the large and best stocks may impregnate the patch or field. It is a noted fact, that through the carelessness of some farmers they allow their seed to degenerate or die out, for want of care in selecting their seed and for want of proper culture, so that in a few years the seed could not be known by the name it had a few years previous. By following these tests and discussions of the same in our meetings, we can and will accomplish more practical benefit than has yet been made by any experimental farm station.

Mr. RHEY. As one of the committee, I received a like quantity of seeds. I sowed with drill and bone meal. Sowed two feet apart. It is growing finely, and looks promising. I can better report the result at our next meeting.

The PRESIDENT appointed the following members to conduct the election: Abner Rutherford, W. H. Holstein, and D. H. Branson.

To audit the accounts of the Treasurer: Ira Tripp, Tobias Barto, J. R. Eby.

Mr. SEILER offered the following, which was agreed to:

Resolved, That a committee of three be appointed by the President, to more fully define the duties of the chemist and geologist of this Society, and that they make report to-morrow.

The PRESIDENT appointed Messrs. Miles, McConkey, and Seiler.

On motion, the President appointed a committee of five to represent this

Society at the annual meeting of the American Agricultural Society, in New York, to meet February 1, 2, and 3.

Mr. KENNEDY moved that at the next meeting of this Society, the subject "If the Cultivation of Tobacco is Promotive of the Agricultural Interests of the State." And during the annual meeting, the question of "How the State Agricultural Society and Local Agricultural Societies can best cooperate for the Advancement of the Agricultural Interests in the State."

Mr. WILHELM moved to amend: "That a committee be appointed on the above resolution, and that they make report to-morrow, said report being open to debate."

Agreed to.

The President appointed as said committee, Messrs. Kennedy, Holstein, and Taggart.

On motion, adjourned.

HARRISBURG, *January 18, 1882.*

The meeting was called to order by the President.

The committee appointed yesterday, reported as follows:

Resolved, That each county agricultural society be instructed to nominate from its members a competent person to act as one of a jury at our annual exhibition. From the number of names so forwarded, the State Society shall select, in advance, such as may be needed for the purpose: *Provided*, That the actual expenses of said judges thus selected be paid by this Society.

Mr. TAGGART. I am opposed to this resolution, for the reason that in the end the officers of this Society must make the selections. This they now have the right and power to do at each exhibition. If the society of my county should select me as one of a jury, and forward my name to the State Society, and for some cause it would be rejected, I would feel that it was an insult. It is usual for the committee of arrangements to request the members of this committee, living within a radius of a hundred miles of where the exhibition is located, to name competent persons, who, in their judgment, are capable to act as judges in the several classes, and, in my opinion, this gives satisfaction. To select from over the State, and this Society to pay the expenses, would very materially effect the revenues, while the same result is accomplished as proposed by this resolution.

Mr. BARTO. Every year since my connection with this Society I have been requested by the President to furnish the names of several persons fully competent to pass on certain classes. Many other Vice Presidents have had similar requests, and that is the manner in which committees are made. It is well known that each officer of this committee can make their selection from active members of other societies or practical farmers, which is done at all exhibitions.

Mr. KELLER. I agree with Mr. Taggart, and believe that the officers of the county societies are fully competent to make such selections, but believe that our rule should guide us. If, for instance, the county societies should sent in six or eight names for judge on one class, one half of this number can only be selected, the other must be rejected. and this might cause much bad feeling as we do now. The same end is reached.

Mr. EGLE offered the following as a substitute:

Resolved, That the members of the Executive Committee from each congressional district in the State suggest to the committee on arrangements the names of competent persons connected with the different county agricultural societies, from which selections may be made for the judges of awards.

Agreed to.

Mr. **Branson** suggested that large premiums be offered to county agricultural societies for the best and largest exhibit. This would be an inducement for them to work hard and make a splendid exhibit

The hour of ten having arrived, at which time the annual meeting convenes, President Bissell addressed the committee as follows:

Gentlemen of the Executive Committee: Increasing cares and failing energies admonish me that it is full time to place at your disposal the generous trust which you have so long confided to me as President of the Pennsylvania State Agricultural Society, and I do so, gentlemen, with the full assurance that its progress will continue, as heretofore, upwards and onward in the path of practical and scientific agriculture. Knowing full well what you have accomplished, I shall ever recur with pride, however long I may be permitted to recur, to the years you have honored me as your President, and the many years I have been associated with you as a member of the Executive Committee.

Gentlemen, I should much regret if I was stepping down to step out from among you, but I do not expect so to do. It shall ever be my desire to aid the great cause in which you have so long and effectually engaged, with whatever wisdom I may have acquired in my association with you in the grand objects and purposes of this Society.

Gentlemen, again tendering to you one and all my unfeigned and hearty acknowledgement for the generous aid and confidence you have ever extended to me in the discharge of the responsible and pleasant duties you have heretofore imposed upon me, I now declare this committee adjourned *sine die.*

PROCEEDINGS OF THE SOCIETY.

Annual Meeting.

On motion, Mr. Neiman was called upon to preside at this meeting.

The following resolution was offered:

Resolved, That the thanks of this Society are due to the late President, William S. Bissell, for the very able manner in which he has presided over the interests of this Society.

Adopted unanimously by a rising vote.

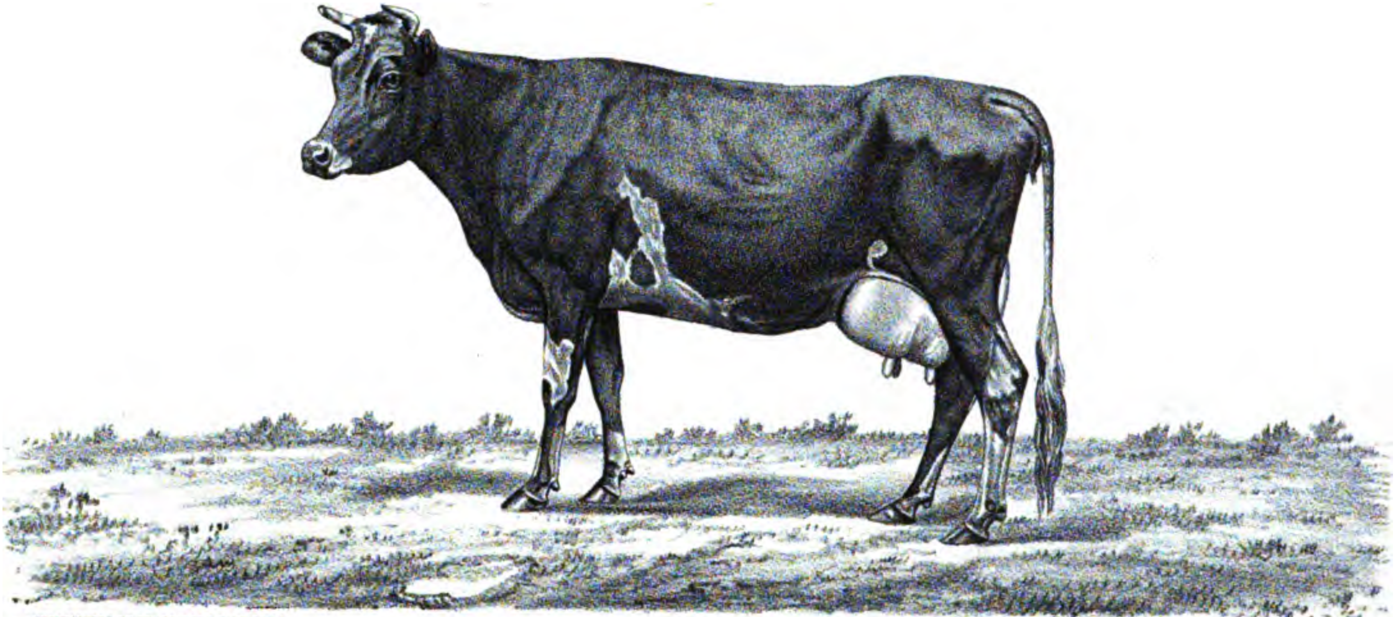
The committee appointed to audit the accounts of the Treasurer, made the following report, which, on motion, was adopted, and the committee discharged:

JOHN B. RUTHERFORD, *Treasurer, in account with the Pennsylvania State Agricultural Society:*

1881.	Cr.				
Jan. 1.	To balance in treasury,			$8,511 74	
Feb. 4.	To interest on five per cent. United States bonds,			25 00	
Apr. 21.	To interest on four per cent. United States bonds,			150 00	
May 5.	To sale of $2,000 United States five per cent. bonds,			2,025 00	
July 1.	To interest on four per cent. United States bonds,			150 00	
Oct. 1.	To interest on four per cent. United States bonds,			150 00	
	To cash from exhibition at Pittsburgh, for single admission, annual membership, &c.,			24,800 03	
	To life membership, John M. Miller,			20 00	
	To cash received from various sources,			1,106 31	
	To State appropriation,			2,000 00	
	Due from Pittsburgh Exposition Society,	$1,016 56			
	Cash balance,	4,674 60	$5,691 16		
	In United States bonds, four per cent.,		15,000 00		
					$38,938 08

Dr.

By rent of office at Harrisburg, &c.,	$367 40
By expenses of Executive Committee,	3,477 25
By printing and advertisements,	3,615 68
By premiums paid,	12,682 53
By medals,	1,006 33
By creamery,	275 10
By decorations and displays,	1,535 82
By superintendence, &c.,	1,120 88
By music,	780 00
By postage, telegraphing, &c.,	929 48
By expenses Secretary's office, clerks, &c.,	783 55



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By express and transportation,	$839 21	
By labor and carpentering,	568 83	
By forage,	970 23	
By expenses President's office,	306 93	
By expenses Treasurer's office,	487 70	
By salary Recording Secretary,	2,000 00	
By salary Corresponding Secretary,	1,000 00	
By salary Treasurer,	500 00	
By balance due from Pittsburgh Exposition Society,	1,016 56	
By balance due Treasury,	4,674 60	
		$38,938 08

The undersigned committee to audit the accounts of the Treasurer, report that they have examined the same, compared the vouchers, and find it correct.

J. R. Eby,
Tobias Barto,
Ira Tripp.

January 18, 1882.

The hour of 12 o'clock having arrived, the chairman declared the election closed, and the judge and tellers reported as follows:

President.

John C. Morris had	81	votes.
John S. Keller "	1	"

Vice Presidents.

1.	D. L. Twaddell had	82	votes.
2.	George Blight "	82	"
3.	William Massey "	82	"
4.	Thomas T. Tasker "	82	"
5.	Charles L. Sharpless "	82	"
6.	David H. Branson "	82	"
7.	William H. Holstein "	82	"
8.	Tobias Barto "	82	"
9.	S. S. Spencer "	82	"
10.	Daniel H. Neiman "	82	"
11.	D. D. Waller "	82	"
12.	Ira Tripp "	82	"
13.	J. S. Keller "	82	"
14.	James Young "	82	"
15.	Joseph Piollett "	82	"
16.	R. P. Allen "	82	"
17.	John A. Lemon "	82	"
18.	John S. Miller "	82	"
19.	Daniel O. Gehr "	82	"
20.	L. A. Mackey "	82	"
21.	George Rhey "	82	"
22.	John Murdoch, jr., "	82	"
23.	W. W. Speer "	82	"
24.	John McDowell "	82	"
25.	Moses Chess "	82	"
26.	J. D. Kirkpatrick "	82	"
27.	James Miles "	82	"

Additional Members Executive Committee.

A. Wilhelm	had	82 votes.
Abner Rutherford	"	82 "
William Taylor	"	82 "
John H. Zeigler	"	82 "
W. B. Culver	"	82 "

Ex-Presidents Members of the Board.

Frederick Watts	had	75 votes.
D. Taggart	"	82 "
Jacob S. Haldeman	"	82 "
Amos E. Kapp	"	45 "
J. R. Eby	"	82 "
W. S. Bissell	"	82 "

Corresponding Secretary.

Elbridge McConkey had . . . . 82 votes.

Recording Secretary.

D. W. Seiler had . . . . 82 votes.

Treasurer.

John B. Rutherford had . . . . 82 votes.

Chemist and Geologist.

A. L. Kennedy had . . . . 82 votes.

Librarian.

William H. Engle had . . . . 82 votes.

Whole number of votes cast, 82.

The undersigned officers appointed to conduct the election of officers of the Pennsylvania State Agricultural Society beg leave to submit the above report.

DAVID H. BRANSON,
WILLIAM H. HOLSTEIN,
ABNER RUTHERFORD,
Committee.

President MORRIS. Gentlemen, I can scarcely find words to express myself in the acknowledgment of the compliment you have just paid me, in selecting me to preside over the deliberations and interests of this Society. Being called upon for the second time to accept this office, I can only say that it will be my aim to increase its usefulness and elevate it to the highest standard of excellence. I will give my time and attention to promote the interests which we represent.

Society meeting then adjourned.

D. W. SEILER,
Secretary.

PROCEEDINGS OF THE EXECUTIVE COMMITTEE.

January 18, 1882—2 o'clock, P. M.

The newly elected Executive Committee was called to order by President Morris.

Mr. RHEY offered the following:

Resolved, That a committee of three be appointed to confer with Governor Hoyt in relation to the enactment of such laws as will secure to the interest of agriculture the best possible results, with the view of securing the passage of such laws as will enable the farmers to obtain the largest possible products for their labor, and the most liberal compensation for the same.

Mr. RHEY. Mr. President, before this matter is acted upon, I desire to say that, in company with several members of this committee, I called upon His Excellency Governor Hoyt, and met with a hearty reception. That gentleman, in the brief interview, said it would be a great pleasure for him to coöperate with this Society in the passage of any law that will tend to promote the agricultural interests of this State.

Agreed to.

The following resolution, offered by Mr. BRANSON, was agreed to:

Resolved, That our premium lists be so amended that all first premium cereals at our annual exhibitions become the property of the Society.

And it is further resolved, That said seeds thus accruing shall be distributed, by the Secretaries of the Society, among the practical farmers of the State, in such quantities as they shall deem proper.

Also the following:

Resolved, That the State Agricultural Society, through its Executive Committee, offer such liberal premiums as may be deemed expedient, to all county agricultural societies of this State, farmers' clubs, &c., making full, generous exhibits of the products of their county at the annual exhibitions of this Society, and the Vice Presidents of each district use their utmost endeavors to secure such displays. and that the said Vice Presidents take charge and represent said exhibits in behalf of said societies or clubs from his district.

Agreed to.

On motion of Mr. SEILER, Messrs. Speer and Egle were added to the Committee of Arrangements, and the President was empowered to increase the said committee to any number.

Mr. RHEY. I move that the committee appointed at the last exhibition to take charge of and distribute seeds. be empowered to obtain seed of spring crops and distribute the some throughout the State.

Agreed to.

The committee to define the duties, &c., of the Chemist, reported:

He shall, when requested by any member of the Executive Committee, give his written opinion on agricultural questions involving chemical principles.

He shall prepare, and present at the January meeting of the Society, each year, a report of the progress made during the preceding year in agricultural science at home and abroad.

He shall make a chemical analysis or examination of fertilizers shown at the Society's exhibition whenever the jury of awards shall make their decision contingent upon the results of such analysis.

He shall coöperate with the Corresponding Secretary in the work of corresponding with the American consols abroad, and the introduction of new and valuable plants in the State.

Mr. **EGLE** moved to amend, that the sum of two hundred and fifty dollars be appropriated for the use and expenses of the chemist of this Society.

The amendment and original resolution were agreed to.

On motion of Mr. **KENNEDY**, the committee on experimental farms was continued, and Mr. McDowell was added to said committee.

Mr. **EGLE** offered the following:

Resolved, That the members of this Executive Committee prepare or cause to be prepared, by the next annual meeting of this Society in January, 1883, a brief but concise history of agriculture and agricultural societies in each county of their district. Which shall be placed in the hands of the proper committee for future publication.

Resolved, That the Secretary shall, in due time, by letter, urge upon each member the importance of this measure; and if unable to be present at the meeting referred to, to forward the same to the Secretary prior to that time.

Which was agreed to.

On motion, adjourned.

D. W. SEILER,
Secretary.

PITTSBURGH, *September 15, 1882.*

On account of the death of President Morris, in May, the committee of arrangements elected James Miles, of Erie county, to fill the vacancy. That gentleman called the meeting to order. The following members were present: Messrs. Rhey, Tripp, Holstein, Miller, Barto, McDowell, Branson, Blight, Twaddell, Taggart, McConkey, Rutherford, and Seiler.

Mr. **BLIGHT** desired some expression from this committee on the advisability of a permanent location of our exhibition at Philadelphia. In his opinion, the migratory character of our exhibition had accomplished our work, and established county societies throughout all the State. Abroad they have permanent locations for all the large and leading agricultural associations; and in my judgment, the time has arrived for this Society to fix upon location where the annual exhibition will be held for a long term of years. At Philadelphia several locations have been suggested, and before any action can be taken by the citizens of that city, I would much desire to have the sense of this committee expressed, so that we can work understandingly.

Mr. **RHEY** moved that this be postponed for action of the committee until 8 o'clock this evening.

Agreed to.

Mr. **RHEY** moved that all plants that are used for decoration, and paid for as such, shall not be allowed to compete for premiums.

Agreed to.

The **PRESIDENT** appointed Messrs. Twaddell and Kennedy as a committee to prepare resolutions upon the death of Vice President Charles Sharpless, and President J. C. Morris.

Mr. RHEY. I move that the President appoint a committee to prepare suitable resolutions to express the sentiments of regret upon the death of Vice President John A. Murdoch, and report at our January meeting.

Agreed to.

Mr. BISSELL. Mr. President and gentlemen, it is with no ordinary emotion that I arise to announce the departure from among us of our venerable friend and coadjutor, John Murdoch, Jr., one of the oldest, and most of you will doubtless agree with me, one of the most useful members of this Society. He departed this life at his farm, where he has resided almost continuously for over fifty years, on the 31st day of March, A. D. 1882, at the ripe age of seventy-eight years. He came with his father's family from county Down, Ireland, in 1826, and shortly after he purchased the farm upon which he died, and which he so long and successfully cultivated both as a farmer, florist, and nurseryman. He was also an intelligent and progressive man, a member of all our local societies for the improvement and spread of horticultural and agricultural information among the people. But we have known him as a member of this Society, we have known him as a modest and genial friend; and we have availed ourselves of his varied skill and his practical knowledge in his chosen profession, a man of great integrity, his word was as readily taken as his bond. My friends, the icy hand of death has been busy amongst us, and in the case of our friend the harvest was ready for the sickel, his sheaves were ripe and full for the garner. It will be long ere this Society can fill his place in its councils. He is gone from among us, and his place shall know him no more forever. Peace to his ashes.

The PRESIDENT appointed Messrs. Rhey and Speer.

The protests of Messrs. Bankers, Longenecker, and others were read.

Mr. MCDOWELL, chairman of the Committee on Devons, explained the manner of judgment, and the ability of the jury selected to pass upon those cattle, and, on motion, the award was confirmed.

Mr. MCDOWELL offered the following:

Resolved, That the Treasurer of the Society be empowered to draw upon the reserve fund to pay all the expenses of this exhibition, and the Treasurer be ordered to collect each day's receipts on the following day, as per agreement with Exposition Society.

Agreed to.

The report of Mr. McDowell on "Experiments in Grain and Seeds," was ordered to be printed in the transactions of the Society.

Adjourned.

SEVENTH AVENUE HOTEL—8 O'CLOCK, P. M.

The adjourned meeting was called to order, when Mr. MCCONKEY offered the following:

Resolved, That a committee of five, together with the President of this Society, be appointed to obtain a location for the purpose of holding annual exhibitions of this Society in future, and that its sense is as follows: That it be located in the city of Philadelphia, if possible, at the most accessible and obtainable point, the details of such arrangements and contracts on our part to be determined by this committee, and that it be invested with full and complete authority in the premises.

The PRESIDENT appointed Messrs. Blight, Twaddell, Kennedy, McConkey, and Seiler on said committee.

Mr. BRANSON submitted the following report on "Experiments with Grains, &c.," selected from those on exhibition at last fair.

PRESIDENT MILES AND GENTLEMEN OF THE PENNSYLVANIA STATE AGRICULTURAL SOCIETY: Agreeably to a resolution adopted by this Society authorizing tests of the different cereals in season in the five counties of Washington, Allegheny, Columbia, Westmoreland, and Chester, your Chester county committee would most respectfully submit the following report as a result of a most thorough and satisfactory test of the following six varieties of wheat, viz: Foltz wheat, Martin's amber, Rogers' white, stubble red, Branson's red, and Virginia red. The above samples were all selected from first premium wheat at the annual exhibition of this Society at Pittsburgh, in September, 1881. The ground selected for the occasion was of a slate-loomy character, oats stubble, and fertilized broadcast and in drills at the rate of 450 pounds of Horveler's raw-bone meal and phosphoric acid to the acre. It will be remembered that the fall of 1881 was one unusually dry, consequently the ground was not seeded until October 3. The plots all came up well, and presented a healthy and uniform appearance. The ground occupied by each plot measured 120 yards long, and ten feet wide, leaving a vacant space between each variety sown of two feet. On plot No 1 was sown 13 pounds Foltz wheat, which yielded at the rate of 42 bushels 43¾ pounds of wheat to the acre, and 7,282 pounds of straw, when cut; No. 2, Martin's amber, 34 bushels 7⅓ pounds wheat, and 8,372 pounds straw; No. 3, *Roger's white*, 86 bushels 53 pounds wheat, and 7,260 pounds straw; No. 4, *stubble red*, 48 bushels 10 pounds wheat, and 7,173 pounds straw; No. 5, *Branson's red*, 30 bushels 44¼ pounds wheat, and 6,980 pounds straw; No. 6, *Virginia red*, 34 bushels 17½ pounds wheat, and 7,118 pounds straw, all of which were cut and harvested July 13, 1882. In addition to the above two varieties of oats have been included, the challenge and white Russian oats. The challenge oats yielding 48 bushels 13 pounds to the acre, and the white Russian oats 55 bushels and 7 pounds to the acre, both fertilized at the rate of 200 pounds assidulated rock per acre. The most flattering results are in store for the future of the Pennsylvania State Agricultural Society, if permitted to continue the good work as yet in its infancy. The advantages of being enabled to intelligently select seed peculiarly adapted to the various soils of our State cannot be over estimated.

All of which is most respectfully submitted,

D. H. BRANSON,
Committee.

Mr. McDOWELL read the following report on same experiments:

MR. PRESIDENT AND GENTLEMEN OF THE BOARD OF THE PENNSYLVANIA STATE AGRICULTURAL SOCIETY: In accordance with a resolution of the Board appointing a committee to make tests of several varieties of wheat on exhibition at the fair of 1881, as a member of that committee, I respectfully submit the following report as the result of my test made in Washington county, this State:

I received the following varieties in like manner and quantity with the other members of the committee, to wit: Martin amber, Virginia red, Imported Mediteranean, stubble wheat, Foltz, Rogers' white beardy. To these I added a sample of Finlay wheat (so-called) from the Department of Agriculture, making in all seven supposed different varieties.

The first four kinds named above were drilled in on oats stubble ground, which was well plowed and harrowed before drilling, (none of the plots were seeded to grass, but, notwithstanding, a most luxuriant crop came up spontaneous.) The kind of drill used was the Farmers' Friend with fertilizer attachment, and the fertilizer used was Bowker's phosphate, at the rate of two hundred pounds per acre.

These four samples were drilled in October 11. The other three were sown broad cast October 12, in an adjoining field on corn stubble ground, which was also well plowed and harrowed before sowing. The phosphate was sown broad cast and all covered with a three-shovel cultivator, and then harrowed. I was obliged to put these last three kinds in this way and place, as I had no other oats stubble empty.

The season had been very dry. On this account I delayed sowing. A good rain fell after sowing, and the wheat came up very fine in five days. All my tests have been carefully and accurately made. I set the drill to sow one and one half bushels per acre, but I suppose this can not be done accurately with different kinds of wheat, using the same feed, as the following seeding shows:

Martin amber, thirteen and one quarter pounds seed, put on twenty-four perches, at the rate of one bushel and twenty-eight and one third pounds per acre. Harvested July 19. Yielded at the rate of thirty-eight bushels and twenty pounds per acre. Measured bushel, sixty-four and one quarter pounds. All my tests stood out too long, and were some injured with the incessant rains; this variety more than any others. Omitting a space of two feet between each plot.

Virginia red, sixteen and one quarter pounds seed put on twenty-eight perches, at the rate of one bushel and thirty-six pounds per acre. Harvested July 15. Yielded at the rate of twenty-six bushels and forty pounds per acre. Measured bushel, sixty-three pounds.

Imported Mediterranean, seventeen pounds of seed put on thirty-two perches, at the rate of one bushel and twenty-five pounds per acre. Harvested July 13. Yielded at the rate of twenty-one bushels and forty pounds per acre. Measured bushel, sixty-three pounds.

Stubble wheat, sixteen and one quarter pounds of seed put on nineteen perches, at the rate of one bushel and thirty-seven pounds per acre. Harvested July 15. Yielded at the rate of twenty-eight bushels and forty-eight pounds per acre. Measured bushel, sixty-five and one half pounds.

The following were cultivated in Foster's Foltz, (weight of seed lost,) sown broad-cast on twenty-two and five tenth perches. Harvested July 12. Yielded at the rate of thirty-two bushels per acre. Measured bushel, sixty-five pounds.

Roger's white beardy, sown fifteen pounds on twenty-four and four tenth + perches, at the rate of one bushel and forty pounds per acre. This variety blasted very badly when heading. Harvested July 14. Yielded at the rate of twenty-two bushels and forty pounds per acre. Measured bushel, sixty-three pounds.

Finlay wheat, so-called. Received from the Department of Agriculture about four pounds seed, which was very impure; had cockle, cheat, rye, and much other filth mixed with it. It is evidently no other than the Foltz wheat, and was probably imposed on the commissioner as a new variety from Canada.

We gave it an extra chance along side the Foltz. It was more thinly sowed than the others, and covered 8.8+ perches. It ripened with the Foltz. Harvested at the same time, and yielded at the rate of thirty bushels and thirty-six pounds per acre. The measured bushel had extra winnowing to make it look better; weighed sixty-two pounds, per bushel falling below the Foltz. I account for the difference only in the quality of the seed.

REMARKS.

The wheat all grew fine, and wintered well. Much of it, however, was killed down to the ground from the frosts of April 13 and 14.

I have one bushel of each variety on exhibition; also, samples in sheaf or heads.

Some of the varieties are much mixed. The purest seed was the Martin Amber; next, the Mediterranean; the Roger's and the Foltz in the order named.

I do not profess to be a judge of the classification of colors in wheat, but I have thought the Martin Amber is a white wheat.

To condense the above to table form:

				Lbs.
Martin Amber yielded at the rate of	38⅓	bus.	per acre, meas. bu.,	64¼
Virginia Red yielded at the rate of	26	bus. 40 lbs.	per acre, meas. bu.,	63
Imperial Mediterranean yielded at the rate of .	21	bus. 40 lbs.	per acre, meas. bu.,	63
Stuble wheat yielded at the rate of	28	bus. 40 lbs.	per acre, meas. bu.,	65½
Foster's Foltz yielded at the rate of	32	bus.	per acre, meas. bu.,	65
Roger's White Beardy yielded at the rate of .	22	bus. 10 lbs.	per acre, meas. bu.,	63
Finlay (so-called) yielded at the rate of . . .	30	bus. 36 lbs.	per acre, meas. bu.,	62

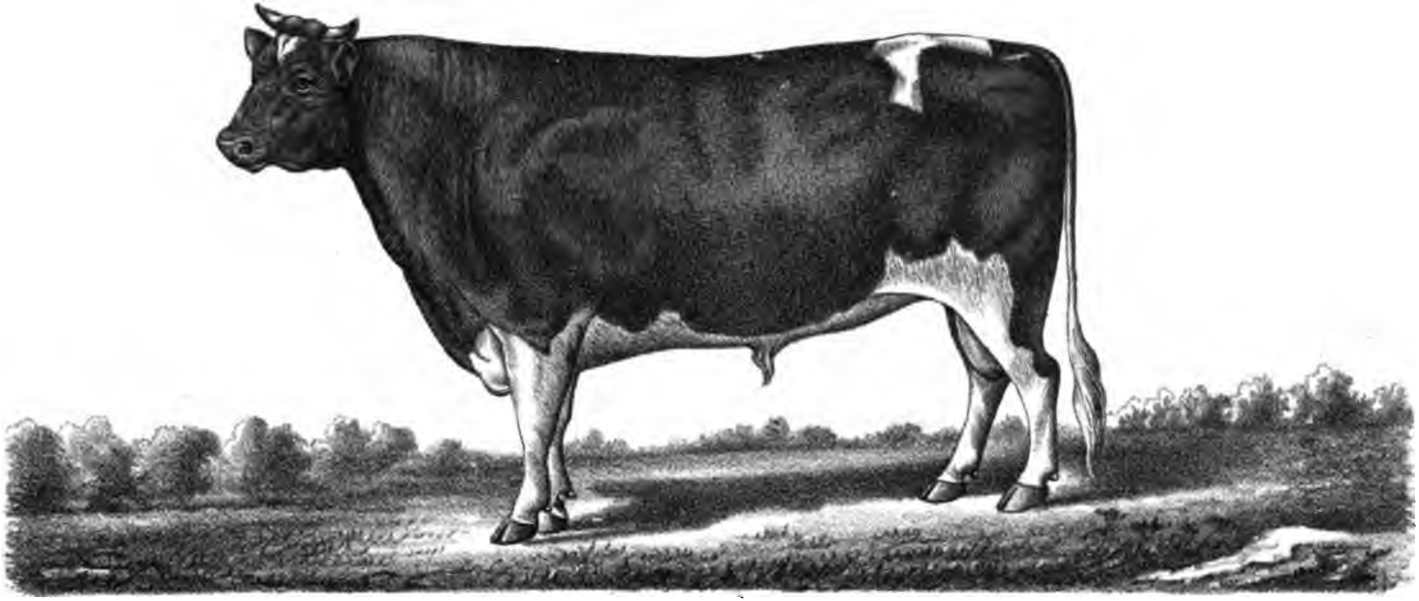
All of which is respectfully submitted.

JOHN McDOWELL.

After which Mr. RHEY, one of same committee, stated that he preferred to wait until the January meeting, when he would make his report.

On motion, adjourned.

D. W. SEILER, *Secretary.*



Holstein Bull "SHADELAND PRINCE," No. 792.

Owned by J. L. Henderson, Washington, Pa.

COMMITTEE OF ARRANGEMENTS,
EXHIBITION, 1882.

JAMES MILES, Erie county, *President.*
W. H. EGLE, Dauphin county.
W. W. SPEER, Allegheny county.
JOHN McDOWELL, Washington county.
JACOB S. HALDEMAN, Dauphin county.
JOHN S. MILLER, Huntingdon county.
ELBRIDGE McCONKEY, Harrisburg, *Corresponding Secretary.*
D. W. SEILER, Harrisburg, *Recording Secretary.*

◆

COMMITTEES OF CO-OPERATION.

APPOINTED BY THE PENNSYLVANIA STATE DAIRYMEN'S ASSOCIATION,
To be announced hereafter.

SCHEDULE OF THE CLASSIFICATION

OF THE

TWENTY-NINTH ANNUAL EXHIBITION.

DEPARTMENT I—Live Stock.

GROUPS.	CLASSES.
I.—Horses,	1. Thoroughbred. 2. Finebred. 3. Carriage, Coach, and Light Draught. 4. Heavy Draught. 4½. Draught Horses. 5. Harness and Saddle. 6. Mules.
II.—Cattle,	7. Short Horns. 8. Devons. 9. Holsteins. 10. Ayrshires. 11. Jerseys. 12. Guernseys. 13. Other recognized breeds. 14. Fat Cattle.
III.—Sheep,	15. Merinos. 16. Middle Wool. 17. Long Wool. 18. Fat Sheep.
IV.—Swine,	19. Chesters. 20. Berkshires. 21. Poland Chinas. 22. Yorkshires. 23. Essex. 24. Suffolks. 25. Jersey Reds.
V.—Poultry and Pet Quadrupeds,	26. Gallinaceous Fowls. 27. Aquatic Fowls. 28. Pigeons and Rabbits.
VI.—Industrial Insects,	29. Bees. 30. Silk Worms.
VII.—Fish,	31. Food Fishes.

DEPARTMENT II—Farm and Garden Products and their Manufactures.

GROUPS.	CLASSES.
VIII.—Meats and Dairy Products,	32. Meats and Cured Fish. 33. Dairy Products.
IX.—Fibrous Products and their Manufactures,	34. Fiber; Raw, Dressed, and Spun, and Wool. 35. Woven and Felted Fabrics. 36. Apparel.
X.—Skins, Horns, and Feathers,	37. Skins; Cured, Tanned, and Dressed. 38. Manufactures of Leather, Horn, and Feathers.
XI.—Oils, Fats, and Soaps,	39. Fats and Fixed Oils. 40. Soaps and Perfumery.
XII.—Grain, Seed, and Flour,	41. Grain and Seeds. 42. Flour and other Farinaceous Products.
XIII.—Sugars and Narcotic and Acid Products,	43. Sugars and Confections. 44. Tobacco. 45. Hops and Fermented Liquors.
XIV.—Vegetables and Grasses,	46. Roots, Tubers, and Bulbs. 47. Grasses and Green Vegetables.
XV.—Fruits and Nuts,	48. Grapes, Stone Fruits, and Pomaceous Fruits. 49. Berries, Nuts, and Tropical Fruits. 50. Preserves and Jellies.
XVI.—Ornamental Plants and Flowers,	51. Growing Ornamental Plants. 52. Cut Flowers and Designs.

DEPARTMENT III—Tools, Implements, and Machinery.

GROUPS.	CLASSES.
XVII.—Clearing Land and Working Wood, . .	53. Clearing Land. 54. Wood Working.
XVIII.—Removing Stone and Working Clay, . .	55. Quarrying. 56. Brick and Tile Making.
XIX.—Motors and Means of Transmitting Power, ...	57. Engines. 58. Power Distributors.
XX.—Pumps and Blowers, ...	59. Raising and Forcing Water. 60. Compressing Air.
XXI.—Making and Repairing Tools, ...	61. Forging and Grinding. 62. Boring and Finishing.
XXII.—Tilling and Planting, ...	63. Turning and Working Soil. 64. Planting and Sowing.
XXIII.—Gathering Crops, ...	65. Mowing and Reaping. 66. Lifting and Storing.
XXIV.—Preparing Products for Market and Consumption, ...	67. Dairy Fittings and Appliances. 68. Sugar Making. 69. Flour and Feed Making. 70. Fiber Manufacturing. 71. Extracting Oils and Making Soaps. 72. Preparing Products other than above.
XXV.—Transportation, ...	73. Freight and Business Vehicles. 74. Pleasure Carriages.

DEPARTMENT IV—Home and Social Improvement.

GROUPS.	CLASSES.
XXVI.—Buildings, Enclosures, and Roads, . . .	75. Buildings and Fencing. 76. Roads, Walks, and Enclosures.
XXVII.—Furniture, ...	77. Furniture of Wood. 78. Furniture, other than of wood.
XXVIII.—Table-ware and Household Machines, .	79. Plate and Cutlery. 80. China and Glassware. 81. Household Machines.
XXIX.—Heating, Cooking, Ventilating, and Lighting, ...	82. Warming Apparatus. 83. Culinary Appliances. 84. Ventilation. 85. Artificial Illumination.
XXX.—Water Supply and Drainage, ...	86. Supplying Water to Buildings and Grounds. 87. Draining.
XXXI.—Fertilizers and Chemicals, ...	88. Artificial Fertilizers. 89. Chemicals.
XXXII.—Education and Natural Science, ...	90. Educational Means and Incentives. 91. Instruments of Precision.
XXXIII.—Fine Arts, ...	92. Carved and Molded. 93. On Paper and Canvas.
XXXIV.—Music and Out-Door Sports, ...	94. Instruments of Music. 95. Implements for Out-Door Sports.
XXXV.—Reports and Essays, ...	96. Reports on exhibition and of Experiments. 97. Essays.
XXXVI.—Field Crops, ...	98. Cereals. 99. Other than Cereals.
XXXVII.—Unclassified, ...	100. Objects belonging to none of the preceding classes.

LIST OF AWARDS OF PREMIUMS.

Exhibition of 1882, (Pittsburgh.)

GROUP I—Horses and Mules.

Grand Prizes.

John Reber, Lancaster, Ohio, best display of horses, consisting of twelve head over one year old—four stallions and eight mares—owned by one exhibitor,	$300 00
John Reber, Lancaster, Ohio, best three thoroughbred colts and fillies, four years and under, on exhibition, sired by imported "Hurrah."	150 00
John Maizland, Saxonburg, Pennsylvania, best three heavy draught colts and fillies, four years and under, on exhibition, sired by "Prince Charley,"	150 00

CLASS 1—THOROUGHBRED HORSES, MARES, AND COLTS.

It is expressly understood that the subjoined prizes are not to be awarded to the weeds and refuse of racing stables, or such other animals (though they may possess purity of blood) as do not fulfill the requirements of the breeder. Animals entered in this class must be registered in the American Stud Book, or be qualified for entrance therein.

John Reber, Lancaster, Ohio, best stallion, five years and over, imported "Hurrah," twenty years, first premium,	$100 00
John Reber, Lancaster, Ohio, second best stallion, five years and over, imported "Kryle Daly," second premium,	75 00
John Reber, Lancaster, Ohio, best stallion, three years and under four years, "Northland," first premium,	50 00
John Reber, Lancaster, Ohio, second best stallion, three years and under four years, "Galway,"	15 00
John Reber, Lancaster, Ohio, second best stallion, two years and under three years, "Poverty,"	10 00
John Reber, Lancaster, Ohio, best brood mare with foal at her foot, "Bonnie Kate," first premium,	75 00
John Reber, Lancaster, Ohio, second best brood mare with foal at her foot, "Sunrise," second premium,	40 00
John Reber, Lancaster, Ohio, brood mare, four years and over, "Lady Middleton," second premium,	30 00
John Reber, Lancaster, Ohio, best filly, three years and under four years, "Nellie Peyton," first premium,	40 00
John Reber, Lancaster, Ohio, second best filly, three years and under four years, "Wauculla," second premium,	25 00
John Reber, Lancaster, Ohio, best filly, two years and under three years, "Hattie M.," first premium,	30 00

John Reber, Lancaster, Ohio, best filly, one year and under two years, " Ailee," first premium.	$20 00
John Reber, Lancaster, Ohio, second best filly, one year and under two years, " Bessie Peyton," second premium,	10 00

CLASS 2—Fine Bred Horses, Mares, and Colts.

Oriental and thoroughbred crosses, Messengers of all branches, Bashaws, Clays, Champions, Morgans, and animals descended from recognized trotting families.

John Reber, Lancaster, Ohio, best stallion, five years and over, "Abdalbrino," nine years, first premium,	$100 00
W. H. S. Ritchie, Canonsburg, Pennsylvania, second best stallion, five years and over, " Chesterwood," five years, second premium,	75 00
Samuel Tippery, Foxburg, Pennsylvania, third best stallion, five years and over, " Young Black George," seven years, third premium,	50 00
A. D. Sutton, Indiana, Pennsylvania, best stallion, three years and under four years, " Burglar," first premium,	50 00
John George, Irwin Station, Pennsylvania, best stallion, two years and under three years, " Uncle Rece," first premium.	30 00
H. H. Wray, Leechburg, Pennsylvania, best stallion, two years and under three years, " Young Ketchum," second premium,	15 00
W. H. S. Ritchie, Cannonsburg, Pennsylvania, best brood mare, four years and over, " Mirabeth," twelve years, first premium,	50 00
Henry W. Burress, Pittsburgh, Pennsylvania, second best brood mare, four years and over, " Maria G.," four years, second premium,	30 00
D. F. McIntosh, M. D., Sharpsburg, Pennsylvania, third best brood mare, four years and over, " Fraud," four years, third premium,	15 00
H. B. Jamison, Pleasant Unity, Pennsylvania, second best filly, three years and under four years, " Belle," second premium,	25 00
W. H. S. Ritchie, Cannonsburg, Pennsylvania, third best filly, three years and under four years, " Nutball," third premium,	15 00

CLASS 3.—Carriage, Coach, and Light Draught Horses, Mares, and Colts.

Cleveland bays, coachers, carriage horses, and animals for the combined purposes of work and road. Standard for stallions, five years and over, fifteen hands three inches in height and twelve hundred pounds in weight. No undersized animal can be awarded a premium in this class under any circumstances, neither will overgrowth be considered a qualification of merit.

P. Quinnet, stallion " Frank," two years and under three years, third premium,	$10 00
L. Peebles, Perryville, Pennsylvania, filly " Mamie," two years and under three years, first premium,	20 00
Preston Brothers, Sharpsburg, Pennsylvania, filly " Flora," two years and under three years, second premium,	15 00

The members of your Committee on Thoroughbred, Finebred, and Coach Classes (Nos. 1, 2, and 3) of the premium list, would respectfully report, that they convened on Tuesday afternoon, 12th of September, and proceeded on their tour of duty. The examination in the first-mentioned class, was confined by necessity to the stock exhibited by John Reber, of Lancaster, Ohio, the only other entry, that of Mr. P. Brown, of Pittsburgh, having been ruled out of competition, by reason of non-appearance on the grounds within the time specified in the published rules. The display of Mr. Reber, in quantity and quality was highly creditable, and included in the several divisions many animals of superior merit. The aged stallions, Hurrah and Kryle Daly, and the three-year-old fillies, Nellie, Peyton, and Wauculla, being particularly noticeable. The former-named animals being, in our judgment, superb specimens of their class, and expressly adapted to the reproduction of horses of the highest type, or first-class roadsters, and animals for general purposes.

We regret that in the succeeding classes, with the exception of the stallions five years and over, and the brood mares in class No. 2, we cannot conscientiously report the same flattering conclusion. Many of the entries were of a remarkably and unusually inferior character in both divisions. Where such conditions existed, we resorted to the rules laid down in the general instruction to judges, and awarded premiums of the second and third degrees only, and in some instances withheld them altogether.

In No. 3, Carriage, Coach and Light Draught Class, this fact was lamentable in the extreme. Some of the competitives being utterly unworthy in form, quality, and general appearance, and not entitled to the recommendation or indorsement of the society for any purpose whatsoever, much less for the intent for which they were entered. Many were mixed in gait, unsound, and deficient in standard adopted for the government of your committee in the furnished conditions of the class. A few were animals of good quality, and evinced considerate breeding, but were disqualified for award by reason of lack of size. To these your committee have recommended discretionary premiums to be determined by your society.

Preceding this report will be found a list of awards.

JOHN S. MILLER, *Chairman*,
L. HENRY TWADDELL,
W. S. JACKSON,
ELBRIDGE MCCONKEY.

Subjoined will be found report of committee of review appointed by the president and members of the Executive Committe upon the request and petition of several of the exhibitors in the carriage, coach, and light draught class:

To JAMES MILES, *President:*

SIR: The committee appointed by you to review the exhibits in Class 3, carriage, coach, and light draught horses, &c., respectfully report they entered upon their work, (on Tuesday, P. M., the 19th and finished the 20th, A. M.,) and would state they made a careful examination of the animals presented in said class, and without a knowledge of the awards made by the former committee, were surprised to find that in every instance they have sustained the previous decisions.

IRA TRIPP, *Chairman*,
JOHN MCDOWELL,
JOHN F. MILES.

PITTSBURGH, PA., *September 20, 1882.*

CLASS 4—DRAUGHT HORSES, MARES, AND COLTS.

Percherons, Clydesdale, Flemish, and the several families of English draught.

Carr & Martin, Jamestown, Pennsylvania, best stallion, five years and over, " Duke of Dunblane," five years, first premium, . .	$100 00
Frank Ardary, Pittsburgh, Pennsylvania, second best stallion, five years and over, " Bijou," seven years, second premium, ...	75 00

C. A. Botts, Bottsville, Pennsylvania, third best stallion, five years and over, third premium,	$50 00
J. McFadgean & Co., Burgettstown, Pennsylvania, best stallion, four years and under five years, " Robert Burns," first premium,	75 00
J. R. Lenhart, Irwin Station, Pennsylvania, second best stallion, four years and under five years, " Dawn of Liberty," second premium,	40 00
J. A. Clark, Prospect, Pennsylvania, third best stallion, four years and under five years, " Earl of Ingleston," third premium,	20 00
J. R. Lenhart, Irwin Station, Pennsylvania, best stallion, three years and under four years, " Choward," first premium,	50 00
Carr & Martin, Jamestown, Pennsylvania, second best stallion, three years and under four years, " Crown Prince," second premium,	30 00
George W. Beale, Natrona, Pennsylvania, third best stallion, three years and under four years, " Tom," third premium,	15 00
J. G. Park, Turtle Creek, Pennsylvania, best stallion, two years and under three years, " Ivanhoe," first premium,	30 00
H. H. Wray, Leechburg, Pennsylvania, second best stallion, two years and under three years, " John H.," second premium,	20 00
John George, Irwin Station, Pennsylvania, best stallion, one year and under two years, " Young Conqueror," first premium,	20 00
R. Hesselgesser & Co., brood mare with foal at her foot, " Phœbe," third premium,	20 00
John Maizland, Saxonburg, Pennsylvania, best brood mare, four years and over, " Maggie," five years, first premium,	50 00
F. J. Harrison, Natrona, Pennsylvania, second best brood mare, four years and over, " Belle," six years, second premium,	30 00
John George, Irwin Station, Pennsylvania, third best brood mare, four years and over, " Daisy," four years, third premium,	15 00
J. G. Park, Turtle Creek, Pennsylvania, best filly, three years and under four years, " Rosebud," first premium,	40 00
J. G. Park, Turtle Creek, Pennsylvania, second best filly, three years and under four years, " Heather Bell," second premium,	25 00
John George, Irwin Station, Pennsylvania, third best filly, three years and under four years, " Nelly," third premium,	15 00
John George, Irwin Station, Pennsylvania, best filly, two years and under three years, " Miss Johnson," first premium,	30 00
R. Hesselgesser & Co., Leasureville, Pennsylvania, second best filly, two years and under three years, second premium,	20 00
R. Hesselgesser & Co., Leasureville, Pennsylvania, third best filly, two years and under three years, third premium,	10 00
John George, Irwin Station, Pennsylvania, second best filly, one year and under two years, " Violet," second premium,	15 00
R. Hesselgesser & Co., Leasureville, Pennsylvania, third best filly, one year and under two years, third premium,	10 00

Tobias Barto,
William Taylor,
R. H. Patterson.

CLASS 4½—DRAUGHT HORSES. (ALL DRAUGHT ANIMALS NOT ADMISSIBLE IN CLASS 4.)

Carr & Martin, Jamestown, Pennsylvania, best stallion, four years and under five years, " Sir Charles," four years, first premium,	$50 00

Aber Brothers, Monroeville, Pennsylvania, second best stallion, four years and under five years, " Prince Charley, Jr.," four years, second premium,	$25 00
R. Hesselgesser & Co., Leasureville, Pennsylvania, third best stallion, four years and under five years, " Frank," third premium,	15 00
Samuel Rankin, Saxonburg, Pennsylvania, best stallion, three years and under four years, " Dan," first premium,	40 00
A. H. Smith, Greensburg, Pennsylvania, second best stallion, three years and under four years, " Tom," second premium,	20 00
R. Hesselgesser & Co., Leasureville, Pennsylvania, stallion " Jim," two years,	10 00
A. H. Smith, Greensburg, Pennsylvania, best brood mare with foal at her foot, first premium,	50 00
R. Hesselgesser & Co., Leasureville, Pennsylvania, second best brood mare with foal at her foot, second premium,	25 00
J. M. Wray, Shady Plain, Pennsylvania, third best brood mare with foal at her foot, third premium,	15 00
J. M. Wray, Shady Plain, Pennsylvania, second best brood mare, " Mattie," six years, second premium,	20 00
John Maizland, Saxonburg, Pennsylvania, second best filly, three years and under four years, " Doll," second premium,	15 00
J. G. Park, Turtle Creek, Pennsylvania, second best filly, two years and under three years, " Topsy," second premium,	10 00
J. L. Mustard, Van Buren, Pennsylvania, third best filly, two years and under three years, " Kate," third premium,	5 00

Your committee on Heavy Draughts and non-registered Draughts respectfully submit the foregoing report, as the result of their labors. The display of heavy draughts was particularly fine, and creditable alike to the exhibitors and the Society. Some of the specimens examined by the committee are certainly the finest ever shown at any fair or exhibition. To particularize or select any single animal for favorable mention would be a difficult task, where all contribute so materially towards making this grand display. Of non-registered draughts, your committee will call attention to it only for the purpose of pronouncing it equal in excellence to the displays usually made in this class. The preceding is a list of the awards.

TOBIAS BARTO,
WM. TAYLOR,
R. H. PATTERSON,
Committee.

CLASS 5—HARNESS AND SADDLE HORSES.

Peter Brown, Pittsburgh, Pennsylvania, best pair for light harness, first premium,	$75 00
Henry W. Burress, Pittsburgh, Pennsylvania, second best pair for light harness, second premium,	50 00
Henry W. Burress, Pittsburgh, Pennsylvania, second best pair coach horses, second premium,	50 00
George W. Evans, Allegheny, Pennsylvania, best gelding for farmer's use, first premium,	30 00
John S. Sell, Greensburg, Pennsylvania, second best gelding for farmer's use, second premium,	20 00
A. E. McCandless, Pittsburgh, Pennsylvania, best roadster, " Gypsy," first premium,	75 00

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Percheron Stallion "TORREADOR,"
Imported by Wm. T. Walters.

T. A. Noble, Pittsburgh, Pennsylvania, second best roadster, "Bluebird," second premium,	$40 00
A. Jackman & Sons, Pittsburgh, Pennsylvania, best pair of ponies, "Nellie" and "Nettie," first premium,	20 00
A. Jackman & Sons, Pittsburgh, Pennsylvania, second best pair of ponies, "Denny" and "Ed." second premium,	10 00

CLASS 6—Mule Teams.

To be shown to wagon, with such tests as the jury may require. Teams will be required to be on the grounds on Wednesday and Thursday, September 13 and 14, at twelve o'clock, noon of each day.

To be shown, on same conditions as above, on Friday and Saturday, September 15 and 16.

W. G. Moore, Womelsdorf, Pennsylvania, best four-mule team, first premium,	$50 00
W. G. Moore, Womelsdorf, Pennsylvania, best two-mule team, first premium,	25 00

The display in harness and saddle horses was not of a character to justify or warrant any special mention. Of course, there were single specimens that were somewhat meritorious, but as a class and display as a whole, your committee content themselves with making the foregoing awards, believing they have done ample justice.

In saddle horses, the specimens were unsound, and therefore unworthy.

The mules were animals of the first quality, and justly entitled to the highest awards.

William Taylor,
Tobias Barto,
John S. Miller,
R. H. Patterson.

GROUP II—Cattle.

CLASS 7—Short-Horns.

Registered in Allen's, Alexander's, the English Herd-Book, or the Ohio Short-Horn Record.

J. R. Anderson, Anderson, Ohio, best herd, consisting of one bull and four cows or heifers, over one year old, first premium,	$150 00
J. S. Steel, Anderson, Ohio, second best herd, consisting of one bull and four cows or heifers, over one year old, second premium,	75 00
J. R. Anderson, Anderson, Ohio, best bull, any age, "Springdale Airdrie,"	50 00
J. R. Anderson, Anderson, Ohio, best cow, any age, "Jennie May,"	50 00
J. R. Anderson, Anderson, Ohio, best bull over three years, "Springdale Airdrie," first premium,	75 00
J. S. Steel, Anderson, Ohio, second best bull over three years, "Young Airdrie," second premium,	50 00
D. A. Eberle, Greensburg, Pennsylvania, third best bull, three years and over, "Duke of Wheatland 2d," third premium,	20 00
J. S. Steel, Anderson, Ohio, best bull, two years and under three years, "Enterprise," first premium,	60 00
J. R. Anderson, Anderson, Ohio, best cow, four years and over, "Jennie May," first premium,	60 00
J. S. Steel, Anderson, Ohio, second best cow, four years and over, "Matilda 8th," second premium,	40 00

J. R. Anderson, Anderson, Ohio, third best cow, four years and over, "Mayflower," third premium,	$20 00
J. R. Anderson, Anderson, Ohio, best cow, three years and under four years, "Minnie Springdale," first premium,	40 00
J. S. Steel, Anderson, Ohio, second best cow, three years and under four years, "Daisy Dean," second premium,	25 00
J. S. Steel, Anderson, Ohio, best heifer, two years and under three years, "Gracie," first premium,	30 00
J. R. Anderson, Anderson, Ohio, second best heifer, two years and under three years, "Mayflower Gem," second premium,	20 00
J. R. Anderson, Anderson, Ohio, best heifer calf, "Pink Springdale," first premium,	15 00

CLASS 8.—DEVONS.

Imported or descended from imported animals only.

J. M. Miller, Hickory, Pennsylvania, best herd, consisting of one bull and four cows or heifers, over one year old, owned by exhibitor, first premium,	100 00
D. & J. Banker, Franklin Forks, Pennsylvania, second best herd, consisting of one bull and four cows or heifers, over one year old, owned by exhibitor, second premium,	75 00
D. & J. Banker, Franklin Forks, Pennsylvania, best bull, any age, "Prince of Wales, 19th,"	50 00
J. M. Miller, Hickory, Pennsylvania, best cow, any age, "Luna,"	50 00
D. &. J. Banker, Franklin Forks, Pennsylvania, best bull, three years and over, "Prince of Wales, 19th," first premium,	75 00
J. B. Longenecker, Union Deposit, Pennsylvania, second best bull, three years and over, "Cole's Puritan, 3d," second premium,	40 00
J. M. Miller, Hickory, Pennsylvania, third best bull, three years and over, "Hartland," third premium,	20 00
J. M. Miller, Hickory, Pennsylvania, best cow, four years and over, "Luna," first premium,	50 00
J. M. Miller, Hickory, Pennsylvania, second best cow, four years and over, "Belle Patterson, 6th," second premium,	25 00
D. & J. Banker, Franklin Forks, Pennsylvania, third best cow, four years and over, "Edith, 5th," third premium,	15 00
J. M. Miller, Hickory, Pennsylvania, best cow, three years and under four years, "Luna, 2d," first premium,	35 00
D. & J. Banker, Franklin Forks, Pennsylvania, second best cow, three years and under four years, "Rose of Baltimore, 8th," second premium,	20 00
J. B. Longenecker, Union Deposit, Pennsylvonia, third best cow, three years and under four years, "Starlight," 3d premium,	15 00
D. & J. Banker, Franklin Forks, Pennsylvania, best heifer, two years and under three years, "Emily, 2d," first premium,	25 00
D. J. Whitmore, Casstown, Ohio, second best heifer, two years and under three years, "Missouri," second premium,	15 00
J. M. Miller, Hickory, Pennsylvania, third best heifer, two years and under three years, "Jubilee," third premium,	10 00
J. M. Miller, Hickory, Pennsylvania, best heifer, one year and under two years, "Adena," first premium,	20 00
J. B. Longenecker, Union Deposit, Pennsylvania, second best heifer, one year and under two years, "Lovely Queen," second premium,	10 0

D. J. Whitmore, Casstown, Ohio, third best heifer, one year and under two years, "Bessie B.," third premium,	$5 00

JAMES MILES, Esq., *President of the Pennsylvania State Agricultural Society:*

SIR: Your committee appointed to view and decide on the merits of the Short-Horns, Class 7, and Devons, Class 8, respectfully report, that they have made a close examination of each animal in their respective entry numbers, and have awarded the premiums as marked in the committee book. They further state, that in their judgment, the exhibition in each of the above herds is of the highest standard of excellence. The show of Devons is unquestionably the best ever made in this State.

Your committee would further state, that they have carefully guarded against awarding premiums to barren animals.

(Signed)
JOHN McDOWELL, *Chairman.*
JOHN GILFILLAN,
M. PRENDERGAST,
JOHN F. MILES,
GEORGE ASHBRIDGE.

PITTSBURGH, *September 14, 1882.*

HOLSTEINS.

Imported or descended on both sides from imported animals only.

Edgar Huidekoper, Meadville, Pennsylvania, best herd, consisting of one bull and four cows or heifers, over one year old, owned by exhibitor, first premium,	$100 00
J. L. Henderson, Washington, Pennsylvania, second best herd, consisting of one bull and four cows or heifers, over one year old, owned by exhibitor, second premium,	50 00
Edgar Huidekoper, Meadville, Pennsylvania, best bull, any age, "Billy Boleyn," first premium,	50 00
Edgar Huidekoper, Meadville, Pennsylvania, best cow, any age, "Hykolina," first premium,	50 00
Edgar Huidekoper, Meadville, Pennsylvania, best bull, three years and over, "Billy Boleyn," first premium,	75 00
A. Sutton, Indiana, Pennsylvania, second best bull, three years and over, "Anton," second premium,	40 00
Brooks & Trotter, Salem, Ohio, third best bull, three years and over, third premium,	20 00
J. L. Henderson, Washington, Pennsylvania, best bull, two years and under three years, "Shadeland Prince," first premium.	50 00
Brooks & Trotter, Salem, Ohio, best bull, one year and under two years, "Opperdoes," first premium,	30 00
R. G. Taylor, East Bethlehem, Pennsylvania, second best bull, one year and under two years, "Bethlehem Lad," second premium,	20 00
J. L. Henderson, Washington, Pennsylvania, third best bull, one year and under two years, "Joe Katzmiller," third premium,	10 00
Edgar Huidekoper, Meadville, Pennsylvania, best cow, four years and over, "Hykolina," first premium,	50 00
Edgar Huidekoper, Meadville, Pennsylvania, second best cow, four years and over, "Geordje," second premium,	25 00
Brooks & Trotter, Salem, Ohio, third best cow, four years and over, third premium,	15 00

J. L. Henderson, Washington, Pennsylvania, best cow, three years and under four years, "Almena," first premium,	$35 00
Brooks & Trotter, Salem, Ohio, second best cow, three years and under four years, " Onondaga Princess," second premium,	20 00
J. L. Henderson, Washington, Pennsylvania, best heifer, two years and under three years, " Katrina 3d," first premium,	25 00
Brooks & Trotter, Salem, Ohio, second best heifer, two years and under three years, " Hilkie," second premium,	15 00
Edgar Huidekoper, Meadville, Pennsylvania, third best heifer, two years and under three years, " No. 15," third premium,	10 00
J. L. Henderson, Washington, Pennsylvania, best heifer, one year and under two years, " Black Bessie," first premium,	20 00
Brooks & Trotter, Salem, Ohio, second best heifer, one year and under two years, "Adeal," second premium,	10 00
Edgar Huidekoper, Meadville, Pennsylvania, third best heifer, one year and under two years, " Bella Donna," third premium,	5 00

The display in this class was large and of unusually fine quality, occupying much of the time of the committee. After careful examination, the foregoing awards were made.

GEORGE BLIGHT,
J. SHANER,
L. HENRY TWADDELL,
Committee.

AYRSHIRES.

Imported or descended on both sides from imported animals only.

A. J. Wilson, Grafton, Ohio, best herd consisting of one bull and four cows, or heifers, over one year old, owned by exhibitor, first premium,	$100 00
W. Fairweather, McLane, Pennsylvania, second best herd consisting of one bull and four cows, or heifers, over one year old, owned by exhibitor, second premium,	50 00
W. Fairweather, McLane, Pennsylvania, best bull, any age, " Excelsior,"	50 00
A. J. Wilson, Grafton, Ohio, best cow, any age, " Honesty,"	50 00
W. Fairweather, McLane, Pennsylvania, best bull, three years and over, " Excelsior," first premium,	75 00
A. J. Wilson, Grafton, Ohio, second best bull, three years and over, " Forester," second premium,	40 00
C. Steffen, Allegheny, Pennsylvania, third best bull, three years and over, "Albert of Linden," third premium,	20 00
A. J. Wilson, Grafton, Ohio, best bull, one year and under two years, " Columbia Lad," first premium,	30 00
W. Fairweather, McLane, Pennsylvania, second best bull, three years and over, " Gowrie Lad," second premium,	20 00
A. J. Wilson, Grafton, Ohio, best cow, four years and over, "Annie," first premium,	50 00
W. Fairweather, McLane, Pennsylvania, second best cow, four years and over, " Mollie Pender," second premium,	25 00
W. Fairweather, McLane, Pennsylvania, third best cow, four years and over, " Lady Pender," third premium,	15 00
W. Fairweather, McLane, Pennsylvania, best cow, three years and under four years, " Lady Kirkwood 5th," first premium,	35 00

A. J. Wilson, Grafton, Ohio, best heifer, two years and under three years, " Honesty," first premium, . . .	$25 00
W. Fairweather, McLane, Pennsylvania, second best heifer, two years and under three years, "Arbutus," second premium, . . .	15 00
C. Steffen, Allegheny, Pennsylvania, third best heifer, two years and under three years, " Clotilda," third premium, ...	10 00
A. J. Wilson, Grafton, Ohio, best heifer, one year and under two years, " Forest Rose," first premium, ...	20 00
C. Steffen, Allegheny, Pennsylvania, second best heifer, one year and under two years, "Agnes," second premium, ...	10 00
W. Fairweather, McLane, Pennsylvania, third best heifer, one year and under two years, " Belle-Fleur," third premium, ...	5 00

After careful examination, the committee has awarded the foregoing premiums. The animals upon exhibition were of the finest quality, and will compare favorably with any heretofore exhibited.

GEORGE BLIGHT,
J. SHANER,
L. HENRY TWADDELL.

CLASS 11.—JERSEYS.

Imported or descended on both sides from imported animals only. Must be registered in the Herd-Book of the American Jersey Cattle Club, or in that of the Royal Society of Jersey.

A. M. Carr, Salem, Ohio, best herd, consisting of one bull and four cows or heifers over one year old, owned by exhibitor, first premium, ...	$100 00
J. D. Risher, Hope Church, Pennsylvania, second best herd, consisting of one bull and four cows or heifers, over one year old, owned by exhibitor, second premium, ...	50 00
A. M. Carr, Salem, Ohio, best bull, any age, first premium, . . .	50 00
A. M. Carr, Salem, Ohio, best cow, any age, " Nixon's Pet," one half first premium, ...	25 00
J. D. Risher, Hope Church, Pennsylvania, best cow, any age, " Fairy Cherry," one half first premium, ...	25 00
A. M. Carr, Salem, Ohio, best bull, three years and over, first premium, ...	75 00
J. K. Dain, Freeport, Pennsylvania, second best bull, three years and over, " Kapp," second premium, ...	40 00
J. W. Watt, Swissvale, Pennsylvania, best bull, two years and under three years, "Antrasine," first premium, . . .	50 00
J. D. Risher, Hope Church, Pennsylvania, second best bull, two years and under three years, " Black Diamond, 5th," second premium, ...	25 00
J. K. Dain, Freeport, Pennsylvania, best bull, one year and under two years, " Young Willie," first premium, ...	30 00
A. M. Carr, Salem, Ohio, second best bull, one year and under two years, second premium, ...	20 00
J. K. Dain, Freeport, Pennsylvania, third best bull, one year and under two years, " Lysander," third premium, ...	10 00
A. M. Carr, Salem, Ohio, best cow, four years and over, " Nixon's Pet," first premium, ...	50 00
J. K. Dain, Freeport, Pennsylvania, second best cow, four years and over, " Martha of Highland," second premium, . .	25 00
J. K. Dain, Freeport, Pennsylvania, third best cow, four years and over, " Dolly Perkins," third premium, ...	15 00

J. D. Risher, Hope Church, Pennsylvania, best cow, three years and under four years, "Polynia," first premium,	$35 00
J. D. Risher, Hope Church, Pennsylvania, second best cow, three years and under four years, "Produce of Bovina, 3d," second premium,	20 00
J. K. Dain, Freeport, Pennsylvania, third best cow, three years and under four years, "Bannavard," third premium,	15 00
J. D. Risher, Hope Church, Pennsylvania, best heifer, two years and under three years, "Fairy Cherry," first premium,	25 00
A. M. Carr, Salem, Ohio, best heifer, one year and under two years, "Fairy of Oxford Hill," first premium,	20 00
A. M. Carr, Salem, Ohio, second best heifer, one year and under two years, second premium,	10 00
J. K. Dain, Freeport, Pennsylvania, third best heifer, one year and under two years, "Emma B.," third premium,	5 00

GUERNSEYS.

Imported or descended from imported animals only.

J. M. Fox, Foxburg, Pennsylvania, best bull, three years and over, "Gipsey Boy," first premium,	75 00
A. M. Carr, Salem, Ohio, best bull, one year and under two years, first premium,	20 00
J. M. Fox, Foxburg, Pennsylvania, best cow, four years and over, "Fan," first premium,	50 00
J. M. Fox, Foxburg, Pennsylvania, second best cow, four years and over, "Frolic," second premium,	25 00
J. M. Fox, Foxburg. Pennsylvania, third best cow, three years and under four years, "Lady Clive," third premium.	15 00
A. M. Carr, Salem, Ohio, best heifer, one year and under two years, "Fairy of Oxford Hill," first premium,	20 00
A. M. Carr, Salem, Ohio, second best heifer, one year and under two years, "Beauty," second premium,	10 00

Your committee, after a full and careful examination in Classes Nos. 11 and 12, respectfully submit the foregoing awards.

GEORGE BLIGHT,
J. SHANER,
L. HENRY TWADDELL.

HEREFORDS.

E. G. Merryman, Cockeysville, Maryland, herd consisting of one bull and six cows or heifers, over one year old, owned by exhibitor,	$75 00

In the absence of any competition, the committee award E. G. Merryman second premium.

J. S. KELLER.
GEORGE RHEY.

GROUP III—Sheep.

CLASS 15.—SPANISH OR AMERICAN MERINOS.

The regulations of the International Exhibition of Sheep held at Philadelphia, September, 1880, govern exhibits in this group.

Sweepstakes.—American Merinos.

John Pow, Salem, Ohio,	$40 00
John Pow, Salem, Ohio, best ram over three years, first premium,	30 00
J. M. Miller, Hickory, Pennsylvania, second best ram over three years, second premium,	20 00
John Pow, Salem, Ohio, best ram, two years, first premium,	20 00
John Perrine, Cardville, Pennsylvania, second best ram, two years, second premium,	15 00
J. M. Miller, Hickory, Pennsylvania, best ram, one year, first premium,	15 00
J. M. Miller, Hickory, Pennsylvania, second best, second premium,	10 00
W. A. Herriott, Oakdale, Pennsylvania, best ram lamb, first premium,	15 00
John Pow, Salem, Ohio, second best ram lamb, second premium,	10 00
John Pow, Salem, Ohio, best pen ewes over three years, first premium,	25 00
J. M. Miller, Hickory, Pennsylvania, second best pen ewes over three years, second premium,	20 00
John Pow, Salem, Ohio, best pen ewes, two years, first premium,	20 00
W. A. Herriott, Oakdale Pennsylvania, second best pen ewes, two years, second premium,	15 00
J. M. Miller, Hickory, Pennsylvania, best pen ewes, one year, first premium,	15 00
W. A. Herriott, Oakdale, Pennsylvania, second best pen ewes, one year, second premium,	10 00
W. A. Herriott, Oakdale, Pennsylvania, best pen ewe lambs, first premium,	15 00
J. M. Miller, Hickory, Pennsylvania, best stock ram and eight of his get, two males and six females, first premium,	40 00
John Pow, Salem, Ohio, second best stock ram and eight of his get, two males and six females, second premium,	25 00

Blacktop or Delaine Merinos.

J. G. Paxton & Bro., Hustonville, Pennsylvania, best ram, three years and over, first premium,	20 00
J. M. Berry, Clokey, Pennsylvania, second premium,	10 00
William Berry, Clokey, Pennsylvania, best ram, two years, first premium,	15 00
J. G. Paxton & Bro., Hustonville, Pennsylvania, second best ram, two years, second premium,	10 00
J. G. Paxton & Bro., Hustonville, Pennsylvania, best ram, one year, first premium,	15 00
Joseph Willison, Hustonville, Pa., second best ram, one year, second premium,	10 00
J. G. Paxton & Bro., Hustonville, Pennsylvania, best ram lamb, first premium,	10 00
Joseph Willison, Hustonville, Pennsylvania, second best ram lamb, second premium,	5 00
William Berry, Clokey, Pennsylvania, best pen ewes over three years, first premium,	20 00
J. G. Paxton & Bro., Hustonville, Pennsylvania, best pen ewes, two years, first premium,	15 00
J. M. Berry, Clokey, Pennsylvania, second best pen ewes, two years, second premium,	10 00

William Berry, Clokey, Pennsylvania, best pen ewes, one year, first premium,	$15 00
J. G. Paxton & Bro., Hustonville, Pennsylvania, second best pen ewes, one year, second premium,	10 00
William Berry, Clokey, Pennsylvania, best pen ewe lambs, first premium,	10 00
J. G. Paxton & Bro., Hustonville, Pennsylvania, second best pen ewe lambs, second premium,	5 00
William Berry, Clokey, Pennsylvania, best fine fat Merinos, first premium,	10 00

We, the undersigned jury, appointed to award premiums in the American Merinos, Spanish Merinos, and Blacktop Merinos, beg leave to say that we found the exhibit a very fine one, and we take great pleasure in stating that the foregoing awards were made with entire unanimity.

J. D. KIRKPATRICK,
ROBERT VAN VOORHIS,
S. B. MERCER,
FRANK P. SPIVEN.

MIDDLE WOOL SWEEPSTAKES.

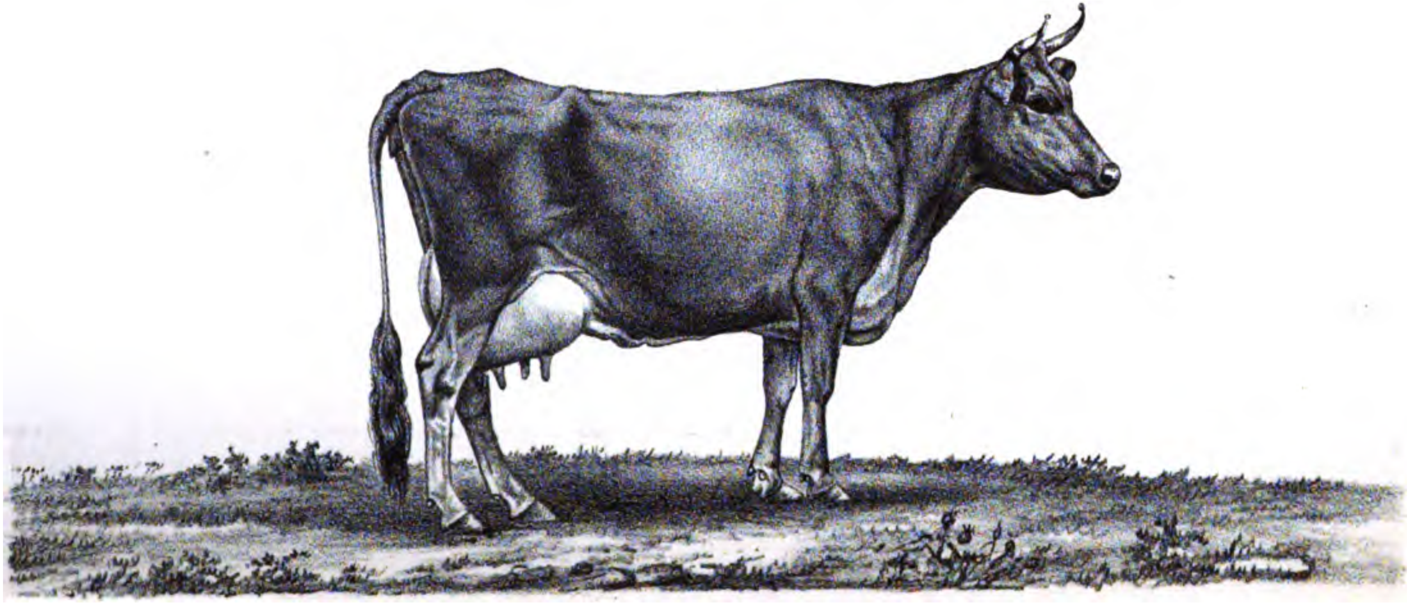
R. M. Fisher, Danville, Kentucky,	$40 00

SOUTHDOWNS.

R. M. Fisher, Danville, Kentucky, ram, two years and over, first premium,	30 00
W. D. Anderson, Anderson, Ohio, ram, two years and over, second premium,	20 00
R. M. Fisher, Danville, Kentucky, ram, one year, first premium,	20 00
W. D. Anderson, Anderson, Ohio, ram, one year, second premium,	10 00
R. M. Fisher, Danville, Kentucky, ram lamb, first premium,	10 00
W. D. Anderson, Anderson, Ohio, ram lamb, second premium,	5 00
R. M. Fisher, Danville, Kentucky, pen ewes, three years, first premium,	25 00
W. D. Anderson, Anderson, Ohio, pen ewes, three years, second premium,	20 00
R. M. Fisher, Danville, Kentucky, pen ewes, one year, first premium,	15 00
W. D. Anderson, Anderson, Ohio, pen ewes, one year, second premium,	10 00
R. M. Fisher, Danville, Kentucky, pen ewe lambs, first premium,	10 00
J. C. Comfort, Shiremanstown, Pennsylvania, pen ewe lambs, second premium,	5 00

OXFORD, HAMPSHIRE, AND SHROPSHIRE DOWNS.

C. H. Ballinger, Atwater, Ohio, ram, one year, first premium,	20 00
A. M. Carr, Salem, Ohio, ram, one year, second premium,	15 00
C. H. Ballinger, Atwater, Ohio, ram lamb, first premium,	15 00
A. M. Carr, Salem, Ohio, ram lamb, second premium,	10 00
C. H. Ballinger, Atwater, Ohio, pen ewes, two years, first premium,	25 00
A. M. Carr, Salem, Ohio, pen ewes, two years, second premium,	20 00
C. H. Ballinger, Atwater, Ohio, pen three ewes, one year, first premium,	20 00
A. M. Carr, Salem, Ohio, pen three ewes, one year, second premium,	15 00



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Imported Guernsey Cow "LUCILLE," No. 115.

Long Wools.

Lincolns, Liecesters, and Cotwolds.

Sweepstakes.

C. H. Ballinger, Atwater, Ohio,	$40 00
T. P. Dickson, Clark, Pennsylvania, ram, two years, first premium,	30 00
Edward Hicks, Goshenville, Pennsylvonia, ram, two years, second premium,	20 00
C. H. Ballinger, Atwater, Ohio, ram, one year, first premium,	20 00
Edward Hicks, Goshenville, Pennsylvania, ram, one year, second premium,	15 00
C. H. Ballinger, Atwater, Ohio, pen ram lambs, first premium	15 00
Edward Hicks, Goshenville, Pennsylvania, pen ram lambs, second premium,	10 00
Edward Hicks, Goshenville, Pennsylvania, pen ewes, two years, first premium,	25 00
C. H. Ballinger, Atwater, Ohio, pen ewes, two years, second premium,	20 00
C. H. Ballinger, Atwater, Ohio, pen ewes, one year, first premium,	20 00
Edward Hicks, Goshenville, Pennsylvania, pen ewes, one year, second premium,	15 00
T. P. Dickson, Clark, Pennsylvania, pen three lambs, first premium,	20 00
Edward Hicks, Goshenville, Pennsylvania, pen three lambs, second premium,	15 00

Fat Sheep.

T. P. Dickson, Clark, Pennsylvania, fine Long Wools, first premium,	25 00
Edward Hicks, Goshenville, Pennsylvania, fine Long Wools, second premium,	10 00
W. N. Black, Danville, Kentucky, fine Middle Wools, first premium,	25 00
T. B. Dickson, Clark, Pennsylvania, fine Middle Wools, second premium,	10 00
J. C. Comfort, Shiremanstown, Pennsylvania, five Southdowns, first premium,	25 00

President Miles, *and Gentlemen of the Executive Committee of the State Agricultural Society:*

Your committee beg leave to submit the subjoined report in Classes 16, 17, 18, and cannot but congratulate the Society in being enabled to show such a collection of animals, nearly all of which would do credit to any former exhibition of the Society. Competition being so close in many instances, your committee labored under considerable difficulty in making their awards. Suffice it to say, that all exhibitors in the classes above specified are entitled to the thanks of this Society.

David H. Branson,
J. Taylor,
W. L. McJunkin,
Jury.

GROUP IV—Swine.

CHESTERS.

Including all large white breeds.

J. Shaner, West Chester, Pennsylvania, herd,	Silver medal.
T. Walter & Sons, West Chester, Pennsylvania, boar, over two years, "Joe," first premium,	$40 00
J. Shaner, West Chester, Pennsylvania, boar, over two years, "Whiteland," second premium,	20 00
J. Shaner, West Chester, Pennsylvania, boar, one year, "Sam," first premium,	25 00
R. Dutton, Milltown, Pennsylvania, boar, one year, "Jim," second premium,	10 00
T. Walter & Sons, West Chester, Pennsylvania, boar, under one year, first premium,	20 00
R. Dutton, Milltown, Pennsylvania, sow, over two years, "Beauty," first premium,	25 00
J. Shaner, West Chester, Pennsylvania, sow, over two years, "Minerva," second premium,	15 00
T. Walter & Sons, West Chester, Pennsylvania, sow, under two years, "Queen of Birmingham," first premium,	15 00
R. Dutton, Milltown, Pennsylvania, sow, under two years, "Belle," second premium,	10 00
J. Shaner, West Chester, Pennsylvania, sow, under one year, "Maggie," first premium,	10 00
R. Dutton, Milltown, Pennsylvania, sow, under one year, "Queen Bess," second premium,	5 00
E. B. Ashbridge, Willistown Inn, Pennsylvania, pen of five sows over six months, first premium,	30 00
T. Walter & Sons, West Chester, Pennsylvania, pen of five sows over six months, second premium,	15 00
R. Dutton, Milltown, Pennsylvania, pen of five sows under six months, first premium,	20 00
T. Walter & Sons, West Chester, Pennsylvania, pen of five sows under six months, second premium,	10 00

POLAND CHINAS.

R. Dutton, Milltown, Pennsylvania, boar, over two years, "Duke," first premium,	40 00
Samuel Cameron, Beaver, Pennsylvania, boar, over two years, second premium,	25 00
R. Dutton, Milltown, Pennsylvania, sow, over one year, first premium,	15 00
R. Dutton, Milltown, Pennsylvania, sow, over one year, second premium,	10 00
S. Cameron, Beaver, Pennsylvania, sow, under one year, first premium,	10 00

CHESHIRES.

Although not provided for in classifying the premium list, the Cheshire swine exhibited by Button Brothers, of Chittenango, New York, are in the opinion of your committee deserving of a special premium. They are fine and meritorious, and in the opinion of your committee worthy of a special award of $100, which we hereby recommend.

JERSEY REDS.

R. Dutton, Milltown, Pennsylvania, boar, one year, first premium,	$20 00
J. L. Mustard, Van Buren, Pennsylvania, boar, under one year, second premium,	10 00
R. Dutton, Milltown, Pennsylvania, sow, one year, first premium,	10 00
R. Dutton, Milltown, Pennsylvania, sow, under one year, second premium,	5 00
J. L. Mustard, Van Buren, Pennsylvania, pen of sows under six months, second premium,	10 00

We unanimously regard the Chester swine on exhibition this year the finest in quality we have ever known entered for premiums.

ABNER RUTHERFORD,
ISAAC ACKER,
J. C. THORNTON,
Committee.

CLASS 20—BERKSHIRES.

H. F. Hudson, Rootstown, Ohio, best herd,	Silver medal.
H. F. Hudson, Rootstown, boar, over two years,	$40 00
A. J. Todd, Beaver, Pennsylvania, boar, over two years,	20 00
G. W. Evans, Allegheny, Pennsylvania, boar, over one year,	25 00
Jefferson Shaner, West Chester, boar, "Hoff,"	15 00
T. Walters & Son, West Chester, Pennsylvania, boar, "Tom," under one year,	20 00
H. F. Hudson, boar, under one year,	10 00
H. F. Hudson, brood sow, "Dolly," over two years,	25 00
T. Walters & Son, brood sow, "Black Bess," over two years,	15 00
J. Shaner, sow, "June," one year,	15 00
H. F. Hudson, sow, "Sallie," under one year,	10 00
H. F. Hudson, pen of five sows over six months,	15 00
H. F. Hudson, pen of five sows under six months,	15 00
A. J. Todd, pen of five sows under six months,	10 00

JAMES MILES, *President Pennsylvania State Agricultural Society:*

DEAR SIR: We, the committee on Classes 20, 22, 23, and 24, respectfully report that the display of Berkshires was exceptionally fine, and competition so close that the committee found great difficulty in deciding on the respective merits.

Respectfully submitted,

ABNER RUTHERFORD,
ISAAC ACKER,
WILLIAM L. ARCHER,
J. A. HAPPER.

Your committee on Classes 26, 27, and 28 make the following report without dissent:

CLASS 26—GALLINACEOUS FOWLS.

R. H. Peck, Ravenna, Ohio, White Cochins, first premium,	$5 00
R. H. Peck, Ravenna, Ohio, White Cochins, second premium,	3 00
J. B. Long, Lancaster, Pennsylvania, Buff Cochins, first premium,	5 00
R. H. Peck, Buff Cochins, second premium,	3 00
R. H. Peck, Black Cochins, first premium,	5 00
R. H. Peck, Black Cochins, second premium,	3 00

B. F. Lewis, Gwynedd, Pennsylvania, Partridge Cochins, first premium,	$5 00
R. H. Peck, Partridge Cochins, second premium,	3 00
B. F. Lewis, Light Brahmas, first premium,	5 00
Dorsey & Wyman, Ellicott City, Maryland, Light Brahmas, second premium,	3 00
R. H. Peck, Dark Brahmas, first premium,	5 00
S. Cameron, Beaver, Pennsylvania, Dark Brahmas, second premium,	3 00
J. Bamford, Monongahela City, Pennsylvania, Colored Dorkings, first premium,	5 00
J. B. Lichty, Lancaster, Pennsylvania, Silver Gray Dorkings, first premium,	5 00
R. H. Peck, Silver Gray Dorkings, second premium,	3 00
Dorsey & Wyman, Brown-Red Games, first premium,	5 00
George W. Evans, Lancaster, Pennsylvania, Brown-Red Games, second premium,	3 00
Christian Boas, Washington, Pennsylvania, Black-Red Games, first premium,	5 00
J. Bamford, Black-Red Games, second premium,	3 00
S. Cameron, Golden Duckwing, first premium,	5 00
J. B. Lichty, Lancaster, Pennsylvania, Silver Duck-wing Game, first premium,	5 00
Dorsey & Wyman, Red Pile Game, first premium,	5 00
Dorsey & Wyman, Red Pile Game, second premium,	3 00
S. Cameron, White Pile Game, first premium,	5 00
M. G. Evans, Lancaster, Black Spanish, first premium,	5 00
B. F. Lewis, Black Spanish, second premium,	3 00
J. B. & S. J. Foster, Sharpsburg, Pennsylvania, White Leghorns, first premium,	5 00
J. B. & S. J. Foster, Sharpsburg, Pennsylvania, White Leghorns, second premium,	5 00
R. H. Peck, Brown Leghorns, first premium,	5 00
A. Lang, Pittsburgh, Brown Leghorns, second premium,	3 00
B. F. Lewis, Dominiques, first premium,	5 00
Dorsey & Wyman, Houdans, first premium,	5 00
Dorsey & Wyman, Houdans, second premium,	3 00
R. H. Peck, Black Polands, first premium,	5 00
A. Lang, Black Polands, second premium,	3 00
Miss L. H. Dorsey, White Polands, first premium,	5 00
Dorsey & Wyman, White Polands, second premium,	3 00
Dorsey & Wyman, Silver Polands, first premium,	5 00
R. H. Peck, Silver Polands, second premium,	3 00
Dorsey & Wyman, Golden Polands, first premium,	3 00
Dorsey & Wyman, Golden Polands, second premium,	3 00
B. F. Lewis, Plymouth Rocks, first premium,	5 00
H. H. Hewit, Williamsburg, Pennsylvania, Plymouth Rocks, second premium,	3 00
B. F. Lewis, Dominiques, first premium,	5 00
Dorsey & Wyman, Dominiques, second premium,	3 00
B. F. Lewis, Golden Spangled Hamburgs, first premium,	5 00
J. Bamford, Silver Spangled Hamburgs, first premium,	5 00
B. F. Lewis, Silver Spangled Hamburgs, second premium,	3 00
Dorsey & Wyman, Black Hamburgs, first premium,	5 00
B. F. Lewis, Black Hamburgs, second premium,	3 00

J. B. & S. J. Foster, White Hamburgs, first premium,	$5 00
J. B. & S. J. Foster, White Hamburgs, second premium,	3 00
Dorsey & Wyman, Golden Penciled Hamburgs, first premium,	5 00
B. F. Lewis, Golden Penciled Hamburgs, second premium,	3 00
Dorsey & Wyman, Silver Penciled Hamburgs, first premium,	5 00
B. F. Lewis, Silver Penciled Hamburgs, second premium,	3 00
J. B. & S. J. Foster, Golden Sebright Bantams, first premium,	5 00
J. B. & S. J. Foster, Golden Sebright Bantams, second premium,	3 00
J. B. & S. J. Foster, Silver Sebright Bantams, first premium,	5 00
Miss L. H. Dorsey, Silver Sebright Bantams, second premium,	3 00
Charles Lippold, Lancaster, Pennsylvania, Rose Comb Bantams, first premium,	5 00
Charles Lippold, Lancaster, Pennsylvania, Rose Comb Bantams, second premium,	3 00
Dorsey & Wyman, Pekin Bantams, first premium,	5 00
Miss L. H. Dorsey, White Booted Bantams, second premium,	3 00
J. B. & S. J. Foster, White Poland Bantams, first premium,	5 00
J. B. & S. J. Foster, White Poland Bantams, second premium,	3 00
Dorsey & Wyman, Black-Red Game Bantams, first premium,	5 00
R. H. Peck, Black-Red Game Bantams, second premium,	3 00
Dorsey & Wyman, Brown-Red Game Bantams, first premium,	5 00
J. R. Trissler, Lancaster, Pennsylvania, Golden Duckwing Bantams, first premium,	5 00
Dorsey & Wyman, Golden Duckwing Bantams, second premium,	3 00
B. F. Lewis, Silver Duckwing Bantams, first premium,	5 00
B. F. Lewis, Silver Duckwing Bantams, second premium,	3 00
Dorsey & Wyman, Red Pile Bantams, first premium,	5 00
Dorsey & Wyman, Red Pile Bantams, second premium,	3 00
Dorsey & Wyman, White Pile Bantams, first premium,	5 00
Dorsey & Wyman, White Pile Bantams, second premium,	3 00
Dorsey & Wyman, Black Game Bantams, first premium,	5 00
Dorsey & Wyman, Black Game Bantams, second premium,	3 00
Dorsey & Wyman, White Game Bantams, first premium,	5 00
J. Bamford, White Game Bamtams, second premium,	3 00
Dorsey & Wyman, Gray Game Bantams, first premium,	5 00
A. Lang, Spangled Bantams, first premium,	5 00
J. B. & S. J. Foster, Langshans, first premium,	5 00
R. H. Peck, Langshans, second premium,	3 00
B. F. Lewis, Rumpless, first premium,	5 00
B. F. Lewis, Frizzles, first premium,	5 00
R. H. Peck, Bronzed Turkeys, first premium,	5 00
S. Cameron, Bronzed Turkeys, second premium,	3 00
S. Cameron, White Turkeys, first premium,	5 00
B. F. Lewis, Black Turkeys, first premium,	5 00
B. F. Lewis, White Guinea Fowls, first premium,	3 00
R. H. Peck, White Guinea Fowls, second premium,	2 00
B. F. Lewis, Pearl Guinea Fowls, first premium,	3 00
J. M. Hagans, Pearl Guinea Fowls, second premium,	2 00
J. C. Comfort, Shiremanstown, Pennsylvania, Pea Fowls,	5 00
J. C. Comfort, Aylesbury Ducks, first premium,	5 00
B. F. Lewis, Brown China Geese, first premium,	5 00
R. H. Peck, Brown China Geese, second premium,	3 00
B. F. Lewis, White China Geese, first premium,	5 00
S. Cameron, White China Geese, second premium,	3 00
R. H. Peck, Toulouse Geese, first premium,	5 00

B. F. Lewis, Toulouse Geese, second premium,	$3 00
R. H. Peck, Wild Geese, first premium,	5 00
R. H. Peck, Wild Geese, second premium,	3 00
R. H. Peck, Embden Geese, first premium,	5 00
Dorsey & Wyman, Rouen Ducks, first premium,	5 00
J. C. Comfort, Colored Muscovy Ducks, first premium,	5 00
J. C. Comfort, White Muscovy Ducks, first premium,	5 00
B. F. Lewis, White Muscovy Ducks, second premium,	3 00
R. H. Peck, Cayuga Ducks, first premium,	5 00
R. H. Peck, Cayuga Ducks, second premium,	3 00
R. H. Peck, Pekin Ducks, first premium,	5 00
R. H. Peck, White Crested Ducks, first premium,	5 00
R. H. Peck, White Call Ducks, first premium,	5 00
R. H. Peck, Grey Call Ducks, first premium,	5 00

Pigeons.

Charles Lippold, Pouters, first premium,	3 00
J. M. Skiles, Pouters, second premium,	2 00
J. M. Skiles, Carriers, first premium,	3 00
J. E. Schum, Carriers, second premium,	2 00
B. F. Lewis, Tumblers, first premium,	3 00
J. M. Skiles, Tumblers, second premium,	2 00
Charles Lippold, Fan-tails, first premium,	3 00
J. M. Skiles, Fan-tails, second premium,	2 00
J. M. Skiles, Turbits, first premium,	3 00
J. E. Schum, Turbits, second premium,	2 00
J. M. Hagans, Dragons, first premium,	3 00
J. E. Schum, Jacobins, first premium,	3 00
J. E. Schum, Jacobins, second premium,	2 00
J. M. Skiles, Magpies, first premium,	3 00
J. M. Hagans, Magpies, second premium,	2 00
J. E. Schum, Nuns, first premium,	3 00
J. M. Skiles, Nuns, second premium,	2 00
Charles Lippold, Trumpeters, first premium,	3 00
T. Robinson, Trumpeters, second premium,	2 00
B. F. Lewis, Antwerps, first premium,	3 00
J. A. Allen, Antwerps, second premium,	2 00
T. Robinson. English Owls, first premium,	3 00
J. M. Skiles, English Owls, second premium,	2 00
C. Lippold, African Owls, first premium,	3 00
J. M. Hagans, African Owls, second premium,	2 00
J. E. Schum, Swallows, first premium,	3 00
J. M. Hagans, Swallows, second premium,	2 00
Charles Lippold, Helmets, first premium,	3 00
J. M. Hagans, Morecaps, first premium,	3 00
J. M. Skiles, Morecaps, second premium,	2 00
J. M. Skiles, Snells, first premium,	3 00
J. M. Hagans, Archangels, first premium,	3 00
J. E. Schum, Archangels, second premium,	2 00
J. M. Skiles, Starlings, first premium,	3 00
J. E. Schum, Frillbacks, first premium,	3 00
J. E. Schum, Ice Pigeons, first premium,	3 00
B. F. Lewis, Ring Doves,	1 00
Best collection poultry, Dorsey & Wyman,	Silver medal.

Best collection pigeons, J. M. Skiles, ...	Silver medal.

The show in this line was not only large in numbers, but fine in quality. Dorsey & Wyman, R. H. Peck, B. F. Lewis, J. B. & S. J. Foster, S. Cameron, J. C. Comfort, and others contributed largely and creditably. Mr. Peck's show of aquatic birds was particularly fine.

Your committee had no difficulty in reaching their conclusions.

DAVID TAGGART, *Chairman*,
R. E. GALBRAITH.

J. C. Comfort had six hundred silk worms at work; were overlooked yesterday in the performance of our duty; he is fully entitled to the first premium.

DAVID TAGGART.

DIVISION F.—Shepherd Dogs.

COLLIE TRIALS.

Thomas H. Terry, Bernardsville, New Jersey, "Tweed 2d," first premium, ...	$50 00
W. J. Walker, East Bethlehem, Pennsylvania, "Dan 3d," .	10 00

E. MCCONKEY,
Chairman.

DEPARTMENT 2.—Farm and Garden Products and their Manufactures.

CLASS 33—DAIRY PRODUCTS.

Sub-Class L.—Butter.

Prem. list.		
No. 417.	J. C. Comfort, Shiremanstown, Pennsylvania, ten pounds dairy butter, prints, first premium, ...	$20 00
	P. D. Barnhart, Banksville, Pennsylvania, ten pounds dairy butter, prints, second premium,	10 00
	I. D. Risher, Hope Church, Pennsylvania, ten pounds dairy butter, prints, third premium, ...	5 00

Sub-Class M.—Cheese.

No. 418.	Pennsylvania State Dairymen's Association, collection of cheese in variety of styles, first premium, .	50 00
No. 419.	Cole Factory, Crawford county, Pennsylvania, collection of ten cheeses of ten different dates, first premium, .	50 00
	Beaver Center Factory, Crawford county, Pennsylvania, collection of ten cheeses of ten different dates, second premium, ...	30 00
	Summit Factory, Crawford county, Pennsylvania, collection of ten cheeses of ten different dates, third premium, ...	20 00

Prem. list.		
No. 420.	Cole Factory, Crawford county, Pennsylvania, collection of five cheeses of five different dates, first premium,	$35 00
	Warren Factory, Crawford county, Pennsylvania, collection of five cheeses of five different dates, second premium,	20 00
	Venango Factory, Crawford county, Pennsylvania, collection of five cheeses of five different dates, third premium,	10 00
No. 421.	Woodcock Factory, Crawford county, Pennsylvania, ten Young America cheeses, first premium,	20 00
	French Creek Factory, Crawford county, Pennsylvania, ten Young America cheeses, second premium,	15 00

JAMES MILES, *President:*

We, the undersigned committee appointed to examine the foregoing classes, respectfully report that we found the display one of unusual excellence and very fine in character. H. & C., Beaver Center, and Cole Factories, and the Pennsylvania State Dairymen's Association deserve great credit for their efforts to make this feature of the exhibition the great success that it was. We make the foregoing awards.

J. R. EBY,
WILLIAM FRANCE,
R. H. SMITH,
Committee.

GROUP IX.

CLASS 34—FIBER, RAW, DRESSED, AND SPUN.

Prem. list.		
No. 424.	J. C. Comfort, Shiremanstown, Pennsylvania, half bushel Silk Cocoons, first premium,	$5 00

Merino Wool.

No. 427.	John McDowell, Washington, Pennsylvania, superfine fleece, first premium,	Silver Medal.
No. 428.	John McDowell, Washington, Pennsylvania, XXX fleece, first premium,	Silver Medal.
No. 429.	John McDowell, Washington, Pennsylvania, ram's fleece, first premium,	Silver Medal.
No. 430.	John McDowell, Washington, Pennsylvania, ewe's fleece, first premium,	Silver Medal.
No. 435.	Joseph Willison, Hustonville, Pennsylvania, sample of delaine wool,	Bronze Medal.

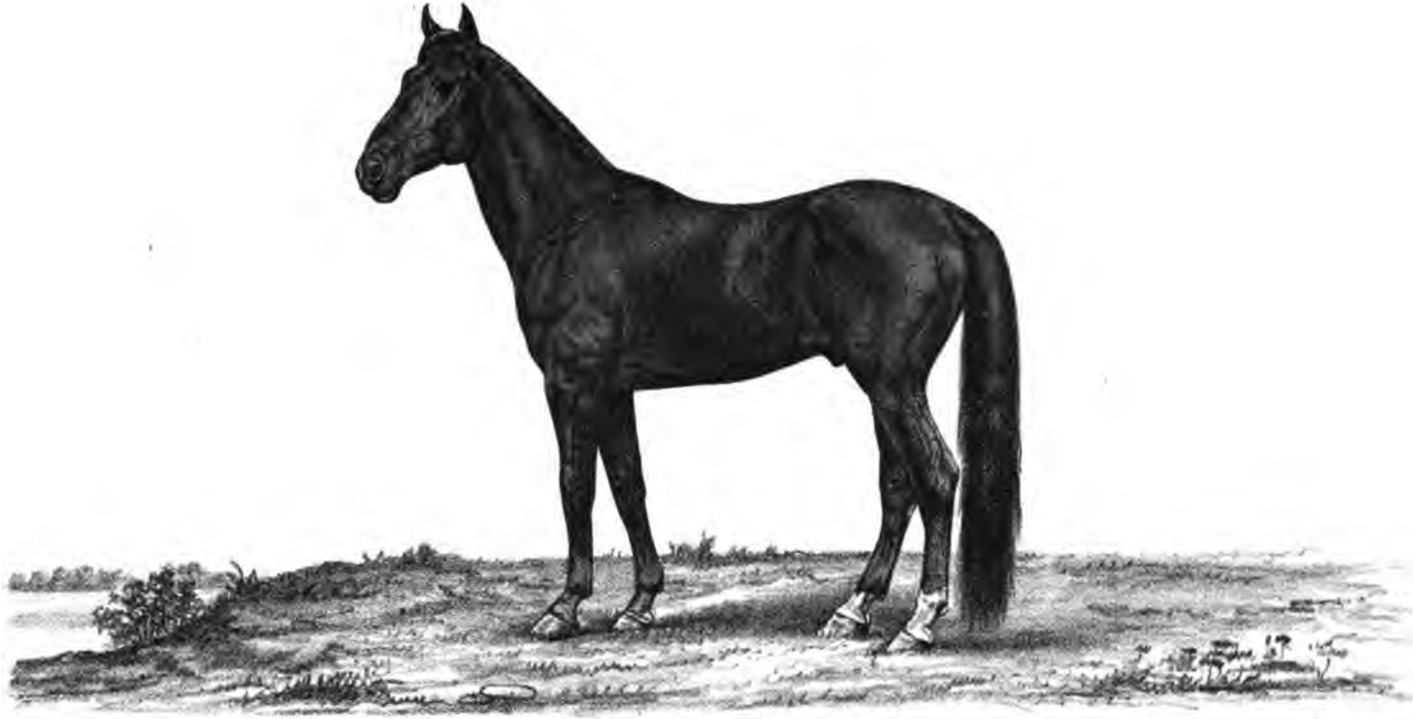
Long Wool.

No. 441.	E. Walter & Sons, West Chester, Pennsylvania, fleece of Lincoln wool, first premium,	Silver Medal.
No. 442.	E. Hicks, Goshenville, Pennsylvania, fleece of Cotswald wool, first premium,	Silver Medal.

JAMES MILES, *President:*

Your committee having examined all the wool offered for competition, make the foregoing award of premiums.

W. H. HOLSTEIN,
W. L. McJUNKIN,
JNO. M. MILLER,
Committee.



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"RED BANK," No. 636.
Owned by N. G. Edelblute, Brookville, Pa.

CLASS 35—WOOLEN AND FELTED FABRICS.

Prem. list.

No. 470. J. & H. Phillips, Pittsburgh, Pennsylvania, table, floor, and oil-cloths, first premium, Silver medal.

Sackett & Wood, Akron, Ohio, rick and harvester covers, ... Diploma.

CLASS 36—APPAREL.

No. 502. J. & H. Phillips, Pittsburgh, Pennsylvania, rubber goods, first premium, Bronze medal.

No. 503. Mrs. U. Fester, Allegheny, Pennsylvania, tambour, hair-pin, and hand-knitting work, first premium, $5 00

No. 504. M. E. Rohan, Allegheny, Pennsylvania, plain needle-work, first premium, . . . 5 00

C. A. Wisner, Allegheny, Pennsylvania, three quilts, special premium, ... 5 00

No. 508. Mrs. U. Fester, Allegheny, Pennsylvania, crochet-work and silk embroidery, first premium, ... 5 00

In addition to the above, we desire to call attention to the general excellence and deserving character of the exhibits ot J. Kauffman & Brothers, Pittsburgh; William Gabowsky, Pittsburgh; Philadelphia Hat Company, Pittsburgh; J. G. Bennett, Pittsburgh; Charles Ruben, Pittsburgh; Rosenbaum & Co.; M. E. Rohan, Allegheny, and recommend a special premium of a diploma to Kilgore & Graham, Pittsburgh, for best exhibit of hats, caps, and furs.

W. H. HOLSTEIN,
W. L. MCJUNKIN,
J. M. MILLER,
Committee.

CLASS 37—SKINS—CURED, TANNED, AND DRESSED.

J. G. Bennett, Pittsburgh, furs and sleigh robes, . . . Bronze medal.

James Callery & Co., Pittsburgh, harness and saddlery, . . Silver medal.

CLASS 38.

Sub-Class P—Saddles, Harness, and Trunks.

John Davis, Pittsburgh, trunks and satchels, ... Silver medal.

Sub-Class Q—Boots and Shoes.

J. H. Borland & Co., Pittsburgh, ladies' and gentlemen's boots and shoes, ... Bronze medal.

CLASS 39—OILS, FATS, AND SOAPS.

J. C. Comfort, Shiremanstown, Pennsylvania, ten pounds lard, . $3 00

CLASS 40—SOAPS AND PERFUMERY.

Arthur Frick, Philadelphia, perfumery, ... Silver medal.

GRAND PRIZES FOR COLLECTIONS UNDER GROUPS XIII, XIV, XV, AND XVI.

Prizes to Competing Societies.

West Fairview Farmers' Club, Cumberland county, Pennsylvania, collection grain, seeds, and vegetables,	$100 00
West Fairview Farmers' Club, Cumberland county, Pennsylvania, collection of fruit,	100 00

James Miles, *President Pennsylvania State Agricultural Society:*

Sir: Your committee appointed to review and decide on the merits of articles exhibited in Classes 37, 38, 39, and 40, and grand prizes for collections under Groups XIII, XIV, XV, and XVI, respectfully report that they have examined all the articles in their respective classes, and awarded the premiums as set opposite each entry in the book.

The display in every department in the Exposition Building is deserving of special mention. The collections of grain, seeds, vegetables, and fruit of the West Fairview Farmers' Club, West Fairview, Cumberland county, Pennsylvania, were especially fine.

John F. Miles,
W. O. Pendergast,
James Callery,
Committee.

CLASS 41—GRAIN AND SEEDS.

Societies and Clubs.

West Fairview Farmers' Club, collection wheat,	$40 00

Company of Producers.

David H. Branson, Atglen, Chester county, six bushels yellow corn,	10 00

Individuals or Firms.

John L. Mustard, Van Buren, Pennsylvania, red wheat,	10 00
David H. Branson, Atglen, Pennsylvania, yellow corn,	5 00
John L. Mustard, Van Buren, Pennsylvania, black oats,	5 00
J. C. Comfort, Shiremanstown, Pennsylvania, barley,	5 00
J. C. Comfort, Shiremanstown, Pennsylvania, buckwheat,	5 00
George W. Boyer, West Fairview, Pennsylvania, display seed grain,	15 00
B. A. Elliott, Pittsburgh, Pennsylvania, one half peck parsnip seed,	3 00
J. C. Comfort, one half peck flaxseed,	3 00
George W. Boyer, three bushels Egyptian wheat,	10 00
W. J. Martin, Catawissa, Pennsylvania, Martin's Amber wheat,	10 00
D. H. Branson, Atglen, Pennsylvania, Mediterranean wheat,	10 00
D. H. Branson, Atglen, Pennsylvania, Roger's White wheat,	5 00
D. H. Branson, Atglen, Pennsylvania, Challenge wheat,	5 00
D. H. Branson, Atglen, Pennsylvania, ears yellow corn,	5 00
P. Barnhart, Bankville, Pennsylvania, bushel rye,	5 00
West Fairview Farmers' Club, clover seed,	5 00
West Fairview Farmers' Club, timothy seed,	5 00
West Fairview Farmers' Club, field beans,	5 00

To the President and Members of the Executive Committee:

GENTLEMEN: The display of wheat was unusully large and varied, most of the samples being of excellent quality. The samples of Martin's Amber were of great excellence, and impressed your committee with the belief that its general introduction in every locality congenial to its growth will add largely to the profits of farming. The sample of Mediterranean raised by D. H. Branson, of Chester county, should be more extensively cultivated by our farmers.

The display of other grain and seeds of all kinds was large. Mr. Branson, as usual, exhibited his famous mammoth corn, which needs only to be seen to cause farmers to plant it.

Respectfully,

GEORGE RHEY,
J. S. KELLER,
S. B. MERCER.

CLASS 42.

Sub-Class V—Bread and Pastry.

J. C. Comfort, Shiremanstown, Pennsylvania, home-made bread, . $5 00

GEORGE RHEY,
S. B. MERCER.

CLASS 43—SUGARS AND CONFECTIONS.

J. H. McBurney, McDonald, Pennsylvania, ten pounds honey, . . $10 00

CLASS 45—HOPS AND FERMENTED LIQUORS.

JAMES MILES, *President Pennsylvania State Agricultural Society:*

Your committee on Classes 43, 44, and 45 make the following report:

Julius Hincke, Egg Harbor City, New Jersey, best collection still wine, . . .	Silver Medal.
G. E. Ryckman, Brocton, New York, second best collection still wine, ...	Silver Medal.
G. E. Ryckman, Brocton, New York, best Catawba wine, ...	$5 00
J. C. Comfort, best Concord, ...	5 00
F. & J. Heinz, Pittsburgh, cider vinegar, ...	3 00
F. & J. Heinz, Pittsburgh, wine vinegar, ...	3 00

JOHN H. ZEIGLER,
C. C. MUSSELMAN,
W. P. McNITE,
Committee.

CLASS 43—SUGARS AND CONFECTIONS.

J. H. McBurney, McDonald, Pennsylvania, ten pounds honey, . . $10 00

CLASS 45—HOPS AND FERMENTED LIQUORS.

Julius Hincke, Egg Harbor, New Jersey, collection still wines, .	
J. C. Comfort, Concord wine, ...	5 00
F. & J. Henz, Pittsburgh, Pennsylvania, cider vinegar, ...	3 00
F. & J. Henz, Pittsburgh, Pennsylvania, wine vinegar, ...	3 00

G. E. Ryckman, Brocton, New York, largest display of still wines,	Silver Medal.
G. E. Ryckman, Brocton, New York, Catawba wine,	$5 00

Your committee on Classes 43, 44, and 45 make the above awards.

JOHN H. ZEIGLER,
C. C. MUSSELMAN,
W. P. MCNITE.

CLASS 46—ROOTS, TUBERS, AND BULBS.

Sub-Class Y—Shown by Individuals.

J. C. Comfort, Shiremanstown, Pennsylvania, best collection,	$20 00
James Gordon, Washington, Pennsylvania, bushel potatoes,	2 00
J. C. Comfort, one half bushel seedling potatoes,	5 00
J. C. Comfort, one half bushel seedling potatoes,	2 00
J. C. Comfort, one half bushel sweet potatoes,	5 00
J. B. & S. Foster, Sharpsburg, Pennsylvania, twelve red onions,	2 00
J. B. & S. Foster, twelve white onions,	3 00
J. C. Comfort, twelve white onions,	2 00
J. C. Comfort, twelve mangolds,	3 00
J. C. Comfort, six roots salsify,	2 00
J. C. Comfort, twelve white table turnips,	2 00
J. C. Comfort, collection turnips,	3 00
J. C. Comfort, twelve carrots,	3 00
J. C. Comfort, twelve beets,	3 00
J. C. Comfort, collection,	2 00
James Gordon, Washington, Pennsylvania, twelve beets,	3 00
James Gordon, collection,	2 00

Respectfully submitted,

MOSES CHESS,
JOHN SCOTT.

CLASS 47—GRASSES AND VEGETABLES.

J. C. Comfort, collection of vegetables,	$10 00
James Gordon, collection of vegetables,	20 00
J. C. Comfort, growing grasses, &c.,	15 00
James Gordon, twelve cucumbers,	3 00
James Gordon, three sweet pumpkins,	3 00
James Gordon, six heads of cabbage,	3 00
James Gordon, three garden squashes,	2 00
James Gordon, collection of field squashes,	5 00
James Gordon, three watermelons,	3 00
James Wardrop, Pittsburgh, twelve peppers,	2 00
James Wardrop, four egg plants,	2 00
James Wardrop, three nutmegs,	5 00
J. C. Comfort, three sweet pumpkins,	2 00
J. C. Comfort, six stalks of rhubarb,	2 00
J. C. Comfort, three field squashes,	3 00
J. C. Comfort, three watermelons,	5 00
Preston Brothers, Sharpsburg, Pennsylvania, six stalks rhubarb,	3 00
Preston Brothers, Sharpsburg, Pennsylvania, six heads of cabbage,	2 00
Preston Brothers, Sharpsburg, Pennsylvania, twelve tomatoes,	3 00
Preston Brothers, Sharpsburg, Pennsylvania, twelve yellow ears of corn,	3 00

Preston Brothers, Sharpsburg, Pennsylvania, twelve white ears of corn,	$2 00
R. A. Philips, Neville Island, Pennsylvania, twelve tomatoes,	2 00
R. A. Philips, Neville Island, Pennsylvania, four egg plants,	3 00
R. A. Philips, Neville Island, Pennsylvania, twelve white ears of corn,	3 00
J. R. & A. Murdoch, Pittsburgh, Pennsylvania, three garden squashes,	3 00
J. R. & A. Murdoch, Pittsburgh, Pennsylvania, collection of garden squashes,	3 00
Samuel Nixon, Woodville, Pennsylvania, three field squashes,	2 00

Sub-Class Z—Pickles and Canned Vegetables.

T. & J. Heinz, Pittsburgh, Pennsylvania, three collections of pickles,	5 00

James Miles, *President:*

The display of pickles, condiments, and vinegar by the firm of T. & J. Heinz, Pittsburgh, Pennsylvania, is of the most elegant and massive character, and deserves especial mention by your committee. It embraces the finest English styles of bottled goods, equal to the best imported, as well as a full line of American styles, home-made and bulk, pickles, sauces, and catsup, put up in buckets, kegs, and barrels, and reflects great credit on the firm for their enterprise, and upon Mr. T. F. Grubbs for the artistic taste displayed in the arrangement of the exhibit.

Respectfully submitted,

Moses Chess,
John Scott,
Committee.

CLASS 48—GRAPES, STONE FRUIT, AND POMACEOUS FRUITS.

Societies or Organized Clubs.

West Fairview Farmers' Club, collection pears,	$10 00

Sub-Class C C—Shown by Individuals or Firms.

Samuel Nixon, general assortment of fruit,	20 00

Grapes.

A. Vance, Pittsburgh, foreign grapes,	10 00
A. Vance, bunch foreign grapes,	5 00

Peaches.

S. Cameron, Beaver, Pennsylvania, late Crawfords,	3 00
S. Cameron, Reeves' Favorite,	3 00
S. Cameron, Ward's Late,	3 00
S. Cameron, new seedling, ("Cameron's Free,")	3 00
S. Cameron, other variety, ("Stump the World,")	3 00
S. Cameron, five varieties,	10 00
S. Cameron, three varieties,	3 00
S. Cameron, arranged basket,	10 00
S. Cameron, collection,	10 00
J. M. Skiles, Perryville, Pennsylvania, five varieties peaches,	5 00
J. M. Skiles, three varieties peaches,	5 00

Plums.

D. H. Branson, Atglen, Pennsylvania, first premium,	$3 00

Pears.

Gabriel Heister, Harrisburg, Pennsylvania, Bartletts,	3 00
Gabriel Heister, Buerre d'Anjou,	3 00
Gabriel Heister, Sheldon,	3 00
Gabriel Heister, Howell,	3 00
Gabriel Heister, Duchesse,	3 00
Gabriel Heister, Louise Bonn,	3 00
Gabriel Heister, collection,	5 00
J. R. & A. Murdoch, Pittsburgh, Pennsylvania, Seckel,	3 00
J. R. & A. Murdoch, Lawrence,	3 00
J. R. & A. Murdoch, other variety,	3 00
J. R. & A. Murdoch, five winter varieties,	10 00
J. R. & A. Murdoch, arranged basket,	10 00
Philip Hess, Harrisburg, Pennsylvania, Belle Lucrative,	3 00
West Fairview Farmers' Club, six fall varieties,	10 00
West Fairview Farmers' Club, collection,	10 00

Apples.

Samuel Nixon, Baldwins,	3 00
Samuel Nixon, Rhode Island Greenings,	3 00
Samuel Nixon, King of Tompkins County,	3 00
Samuel Nixon, Northern Spy,	3 00
Samuel Nixon, Rambo,	3 00
Samuel Nixon, any other variety,	3 00
Samuel Nixon, arranged basket,	10 00
Samuel Nixon, collection,	15 00
S. Cameron, Maiden's Blush,	3 00
S. Cameron, Pound,	3 00
S. Cameron, any other variety,	5 00
James A. Nelson, Indian Run, Pennsylvania, Hubbardstown Nonesuch,	3 00
James A. Nelson, ten fall varieties,	10 00
James A. Nelson, collection,	10 00
J. C. Comfort, collection,	10 00
Philip Hess, Harrisburg, Pennsylvania, Smoke-house,	3 00
George Houser, Harrisburg, Pennsylvania, Golden Russets,	3 00

Quinces.

Samuel Nixon, arranged basket,	5 00

JAMES MILES, *President Pennsylvania Agricultural Society:*

Your committee respectfully present the following report, the awards being set opposite each entry:

J. C. Comfort exhibited the only collection of native grapes—a very fine exhibit. We have proof to show that he did not grow them. Consequently we did not pass upon his exhibit, but leave the matter of premiums to the officers of the Society to adjust.

Mr. James Wardrop, of Pittsburgh, exhibited several baskets of peaches, which evidently were very fine when brought here, but owing to the fact that they were brought on the first day of the fair, and entirely decayed, we would recommend that he be awarded a premium for the same.

Taking into consideration the very unfavorable season for fruit, the display, taken as a whole, is very creditable.

Gabriel Heister,
L. A. Mackey,
J. B. G. Kinsloe.

CLASS 49—Berries, Nuts, and Tropical Fruit.

J. C. Comfort, uncultivated walnuts,	$1 00
J. C. Comfort, Wilson blackberries,	2 00
J. C. Comfort, other blackberries,	2 00

CLASS 50—Preserves and Jellies.

J. C. Comfort, apple butter,	$2 00
F. & J. Heinz, Pittsburgh, Pennsylvania, best general collection preserved fruits,	Silver Medal.
Preston Brothers, second best collection preserved fruits,	5 00
F. & J. Heinz, apple butter,	1 00

The exhibit of F. & J. Heinz, of Pittsburgh, in preserved fruits and jellies is very large and varied, and of the highest merit.

The arrangement by their attentive superintendent, T. F. Grubb, is very effective, and deserves special mention.

David Taggart, *Chairman.*

CLASS 51—Growing Ornamental Plants.

(Held in abeyance.)

CLASS 52—Cut Flowers and Designs.

B. A. Elliott, Pittsburgh, general collection, named varieties,	$10 00
B. A. Elliott, dahlias, seedling,	1 00
B. A. Elliott, roses, general collection,	5 00
B. A. Elliott, verbenas, twelve specimens, twelve varieties,	1 00
B. A. Elliott, petunias, twelve specimens, twelve varieties, (double,)	3 00
B. A. Elliott, petunias, twelve specimens, twelve varieties, (single,)	2 00
B. A. Elliott, herbaceous phlox, specimens,	2 00
B. A. Elliott, china asters, twelve varieties,	1 00
William Hamilton, Allegheny, roses, twelve specimens, (by amateur,)	3 00
James Vick, Rochester, general collection named varieties,	5 00
James Vick, collection not less than six lillies,	3 00
James Vick, dahlias, twenty-four varieties,	3 00
James Vick, dahlias, seedling,	2 00
James Vick, verbenas, twenty-four specimens,	2 00
James Vick, gladiolas, twelve specimens, twelve varieties,	3 00
James Vick, china asters, twelve varieties,	2 00
J. R. & A. Murdoch, Pittsburgh, dahlias, twenty-four varieties,	2 00
J. R. & A. Murdoch, collection roses,	10 00
J. R. & A. Murdoch, gladiolas,	2 00
J. R. & A. Murdoch, double geraniums,	3 00

Flowers and Designs.

B. A. Elliott, Pittsburgh, design of cut flowers,	$15 00
B. A. Elliott, design of growing plants and flowers,	15 00
B. A. Elliott, design for table,	8 00
B. A. Elliott, basket cut flowers,	5 00
B. A. Elliott, pair hand boquets,	3 00
B. A. Elliott, brides' boquets,	3 00
B. A. Elliott, plateau of cut flowers, eighteen inch frame,	5 00
B. A. Elliott, funeral design, three pieces,	15 00
B. A. Elliott, funeral design,	10 00
J. R. & A. Murdoch, Pittsburgh, cut flowers,	25 00
J. R. & A. Murdoch, growing plants and flowers,	20 00
J. R. & A. Murdoch, table design,	10 00
J. R. & A. Murdoch, funeral design, three pieces,	25 00
J. R. & A. Murdoch, funeral design,	15 00

JAMES MILES, *President, and Members of Executive Committee:*

GENTLEMEN: Your committee take pleasure in submitting the foregoing as their awards in Class 52, deeming it unnecessary to commend what will be universally admired by all who have the good fortune to see them in their freshness and beauty.

Respectfully submitted.

WILLIAM S. BISSELL,
JULIA S. MAIRS,
N. S. BISSELL.

Mr. Elliott, with some show of equity, and under our rules, claims that his general collection contained some fifty distinct varieties or species, and that Mr. Vick, to whom the committee awarded the first premium, only contained seventeen varieties, and that his showy phlox was annual and not perennial. In the haste of examination, your committee only judged from general appearances, and, also, that his roses in general collection showed fifty varieties, and the other, to which was awarded the first premium, only contained twenty-five varieties.

WILLIAM S. BISSELL, for *Committee.*

DEPARTMENT 3.—Tools, Implements, and Machinery.

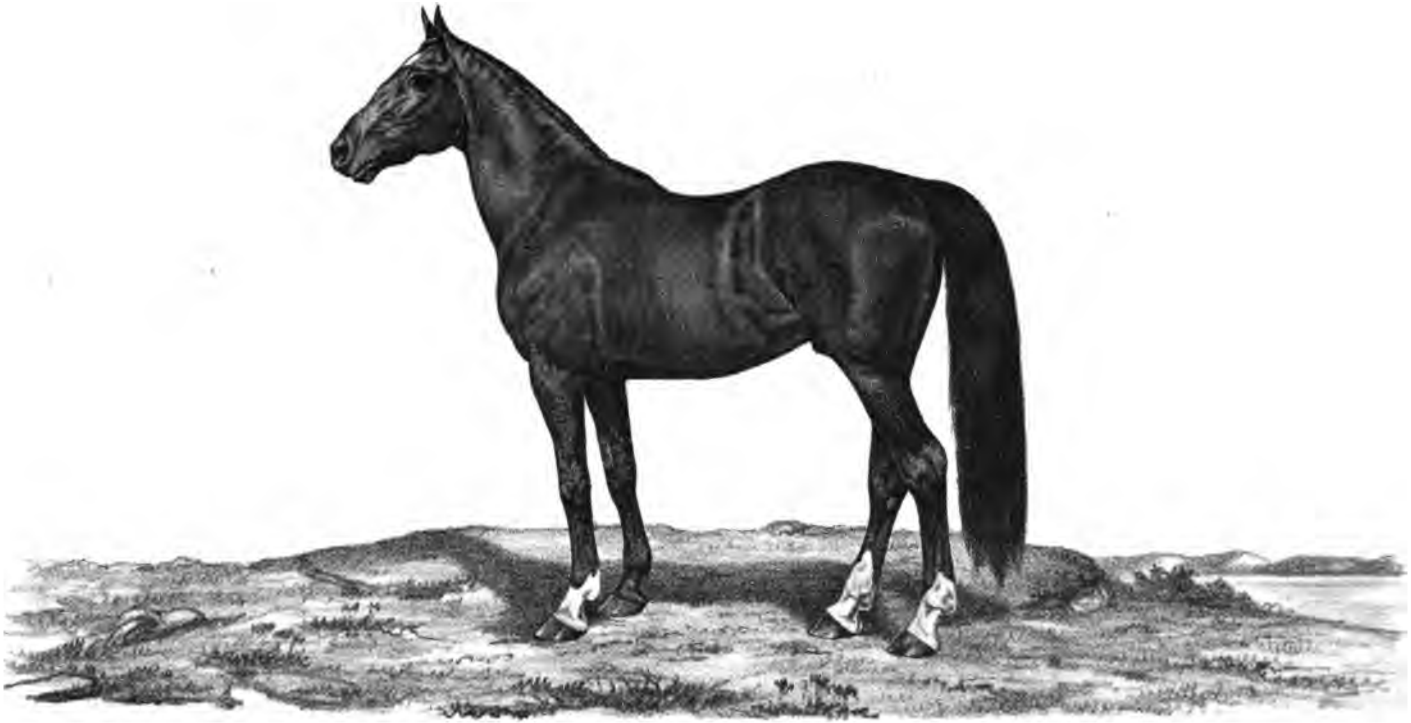
GRAND PRIZES FOR COLLECTIONS.

Duff, McKean & Co., Pittsburgh, Pennsylvania, best collection of agricultural implements and machinery,	$100 00
J. W. Scott, Pittsburgh, second best collection of agricultural implements and machinery,	50 00

The undersigned committee report that we have carefully examined the machinery and implements, and award the first premium of one hundred dollars to Duff, McKean & Co., and the second premium of fifty dollars to J. W. Scott & Co.

JOHN J. NISSLEY,
W. F. RUTHERFORD.

To the President and Executive Committee, State Agricultural Society.



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"HERO OF THORNDALE."

CLASS 54—Wood-Working.

Chandler & Taylor, Indianapolis, Indiana, pony circular saw-mill,	Bronze medal.
Russell & Co., portable saw-mill,	Silver medal.

The committee consider the saw-mills as perfect as they can be constructed, with every convenience for regulating the size of the lumber to be sawed, with safety to the attendant. They are limited to two prizes, or they would recommend a medal to be awarded to the Harrisburg Foundry and Machine Works. Upon reflection, they do recommend that the executive committee award them one.

CLASS 55—Quarrying.

Keystone Portable Steam Drill Company, Fallstown, Pennsylvania, steam drill for wells,	Silver medal.
Totten & Co., Pittsburgh, stone crusher and pulverizer,	Silver medal.
Shields & Duff, Pittsburgh. double-acting lifting jack,	Diploma.

CLASS 56—Brick and Tile Making.

J. W. Penfield, Willoughby, Ohio, combined brick and tile machine,	———

James Miles, *President:*

The committee having performed the duty assigned, would respectfully report that we gave all the exhibitors every opportunity to show the working of their machines, and are satisfied they are worthy of the premiums awarded.

A. O. Heister,
S. B. Allison,
Committee.

CLASS 57—Engines.

Harrisburg Foundry and Machine Works, portable engine,	Gold medal.
Gillespie Brothers & Co., Pittsburgh, steam engine and boiler,	Silver medal.
Duff, McKean & Co., Pittsburgh, monitor portable engine,	Special mention.
J. W. Scott & Co., Pittsburgh, "Peerless," manufactured by Geiser Manufacturing Company, Waynesboro', Pennsylvania, traction engine,	Gold medal.
Reed & Smith, Pittsburgh, C. Russell & Co., of Canton, Ohio. traction engine,	Silver medal.
Gray, Shook & Co., Pittsburgh, injector,	Bronze medal.
Duff, McKean & Co., Pittsburgh, Eagle horse-power sweep,	Bronze medal.
J. A. McCormick, Pittsburgh, Otto silent gas engine,	Silver medal.

Power Distributors.

A. Wilson Dalzell, Pittsburgh, jacketed pipes,	Bronze medal.
J. H. Phillips & Co., Pittsburgh, rubber belting,	Diploma.
J. H. Phillips & Co., Pittsburgh, leather belting,	Diploma.

Raising and Forcing Water.

Wilson, Snyder & Co., Pittsburgh, steam pump,	Silver medal.
Gray, Shook & Co., Pittsburgh, feed pump,	Silver medal.

H. Houston & Co., Pittsburgh, lift and force pump, . .	Diploma.
Reinecke Brothers, Pittsburgh, collection of iron pumps, .	Diploma.
H. D. McKnight & Co., duplex pump, . . .	Diploma.
Wilson, Snyder & Co., Pittsburgh, feed pump, ...	Special mention.

JAMES MILES, ***President Pennsylvania State Agricultural Society:***

SIR: Your committee appointed to examine and report upon the exhibits in Classes 57, 58, and 59, have the honor to submit the following: Some of the entry numbers were well represented, others were deficient, we regret to say, and owing to lack of time and means of testing full working tests of many of the machines could not be made, in which cases the awards were made upon material and workmanship, and apparent adaptability for the purposes intended.

CLASS 57—ENGINES.

Prem. list.		
No. 899.	Steam Engines, best portable, with boiler attached. The Harrisburg Foundry and Machine Works, Harrisburg, Pennsylvania, exhibit their Paxton Engines, running five horse-power horizontal tubular boiler, with independent pump, to which we award first prize, a	Gold medal.
	For second best, we award the prize to Gillespie Brothers & Co., Pittsburgh, for their horizontal engine, and vertical tubular steam boiler, running eight horse-power engine, and ten-horse power boiler, which combines several novel improvements, a	Silver medal.
	Huff, McKean & Co., Pittsburgh, exhibits one of C. Aultman & Co.'s Canton, Ohio, vertical tubular boilers, six-horse power, and engine for general farm use, which seems well adapted to the purpose, but was not in operation, and recommend	Special medal.
No. 901.	W. D. Hartupen. of Pittsburgh, exhibits a horizontal engine, with cylinder twelve inches diameter and twenty inches stroke, running, which is simple in construction, and shows good workmanship, but as there was no competition, we refer the award to the Executive Committee.	
No. 904.	Steam engine Traction, best for farm use. Two entries. J. W. Scott & Co., Pittsburgh, exhibits the "Peerless," twelve horse-power, manufactured by the Geiser Manufacturing Company, Waynesboro', Pennsylvania, eight by ten inch cylinder, with self-steering gear, shown in motion; steel axle, wood and iron combination wheels, to which we award the first prize,	Gold medal.
	Reed & Smith, Pittsburgh, exhibits a thirteen horse-power engine, built by C. Russell & Co., Canton, Ohio, seven and one half by twelve inch cylinder, and fitted with tongue for horse steering, but capable of having self-steering chain and worm-gear applied; as the engine is simple in construction, we recommend the second premium, ...	Silver medal.

Prem. list.

No. 905. Steam engine Traction, best for common roads. There was but one entry, that of Duff, McKean & Co., manufactured by Nichols, Sheppard & Co., of Battle Creek, Michigan, eight horse-power boiler, double riveted with copper ferrules to tubes, single eccentric, and cog-wheel reversing gear. Shown in motion, and seeming well adapted for the purpose. As there was no competition, we refer the award to the Executive Committee.

No. 918. Boiler Injector: Gray, Shook, & Co., Pittsburgh, exhibit the Eclipse injector, with a single lever, which seems meritorious, and to which we award, Bronze medal.

No. 921. Horse-power Sweep: Duff, McKean & Co., exhibit a two or four horse-power, with changeable speed, to which we award a . . . . Bronze medal.

Best Gas Engine, One-horse Power or over.

No. 913. J. A. McCormick, of Pittsburgh, entered the Otto Silent Gas Engine, built by Schlicker, Schuman & Co., of Philadelphia, which we consider well adapted for the purpose, and award to it a . Silver medal.

No. 925. A. Wilson Dalzell, of Pittsburgh, entered and exhibited jacketed pipes for steam. The covering being composed of cotton seed hulls, surrounded by sheet iron, forming a good non-conductor for steam at moderate temperature, but, as there was no competition, we refer the award to the Executive Committee.

No. 929. J. & H. Phillips, of Pittsburgh, exhibited the belting manufactured by the Boston Belting Company, for which they claim fine finish, and make a large display of different sizes, and, as there was no competition, we would recommend the Executive Committee to award them a . . . Diploma.

The same firm exhibited leather belting, manufactured by J. B. Hoyt & Co. The same was well made of excellent quality, with short lap—a fine display—to which we award a Diploma.

No. 936. Reinecke Bros., Pittsburgh, have on exhibition a very large collection of excellent pumps, fitted with water packed valves, to which we award a Diploma.

No. 937. Gray, Shook & Co., Pittsburgh, exhibit feed pumps for boilers. They are well constructed with brass valves, to which we award a . Silver medal.

Wilson, Snyder & Co., Pittsburgh, also exhibits a feed pump with detached valves, which seem entitled to . . . . . Special mention.

No. 940. Best steam pump for general purpose. Wilson, Snyder & Co., show several pumps of different sizes, the largest having a capacity of two million gallons per day. They are well built, and have some important improvements, giving easy access to the valves, so we award them a . . . Silver medal.

C. Henry Roney, *Chairman.*
L. A. Mackey,
J. B. G. Kinsloe.

In Class 57, No. 918, low water detectors, I find one exhibit, that of R. D. Barr & Co., Pittsburgh—Barr's high steam and low water detector and signal—which I have carefully examined, and believe to be a useful and important invention, and recommend that it receive a special award of a diploma.

Respectfully,
C. Henry Roney, *Chairman.*

CLASS 62—Boring and Finishing.

Gillespie Bro. & Co., Pittsburgh, bench vise, ... Bronze medal.

Respectfully submitted.

J. C. Thornton,
C. C. Morris.

CLASS 63—Working Soil.

James Miles, *President Pennsylvania Agricultural Society:*

Sir: Your committee appointed to examine and report on Classes 63 and 64, have the honor to submit the following:

We found the exhibits, in most of the classes, well represented. Most of the tools and implements being of excellent character and quality for the purposes for which they are intended to be used; but, owing to lack of time and means for testing, working trials could not be made, except in occasional instances.

Prem. list.		
No. 972.	Best collection plows containing several large collections, of which that of Alexander Speer & Sons, Pittsburgh, contained the largest number of styles of different kinds of plows, of fine quality and workmanship, and to them we award a	Silver medal.
	To the Syracuse Chilled Plow Company, of Syracuse, New York, for the second best collection, we recommend a	Bronze medal.
No. 973.	Alexander Speer & Sons, one-horse plow,	Bronze medal.
	Syracuse Chilled Plow Company, one-horse plow,	Special mention.
No. 974.	Alexander Speer & Sons, one-horse plow with cultivator combined,	Bronze medal.
No. 975.	Alexander Speer & Sons, walking sub-soil plow,	Special mention.
No. 976.	Alexander Speer & Sons, walking side-hill plow,	Bronze medal.
	Syracuse Chilled Plow Company, second best walking side-hill plow,	Special mention.
No. 977.	Duff, McKean & Co., Pittsburgh, sulkey plow,	Silver medal.
No. 981.	Nellis McIntire & Co., Pittsburgh, walking cultivator—shows some novel, and, we think, important improvements,	Diploma.
No. 982.	Duff, McKean & Co., sulkey cultivator,	Bronze medal.
No. 983.	Hench & Dromgold, Ickesburg, Pennsylvania, corn cultivator and plow combined,	Bronze medal.
No. 984.	Hench & Dromgald, sulkey cultivator and double row corn-planter combined,	Bronze medal.

Prem. list.		
No. 985.	Duff, McKean & Co., sulkey corn plow, . . .	Bronze medal.
	J. W. Scott & Co., Pittsburgh, walking sulkey corn plow, ...	Special mention.
No. 989.	Nash & Bro., Harrisburg, Pennsylvania, best pulverizer and leveler, annexed to or detached from harrow, ...	Bronze medal.
No. 990.	Alexander Speer & Sons, clod crusher, ...	Bronze medal.
No. 991.	Alexander Speer & Sons, iron roller for general use,	Bronze medal.
No. 992.	Duff, McKean & Co., collection spades, shovels, hoes, ...	Diploma.
No. 994.	Duff, McKean & Co., collection ditching and draining tools, ...	Diploma.
No. 995.	Otsego Mills Fork Company, Girard, Pennsylvania, collection spading and manure forks,	Diploma.
No. 996.	S. L. Allen, Philadelphia, collection garden tools,	Diploma.

C. HENRY RONEY, *Chairman.*
SAMUEL PATTERSON,
J. B. BEATTY,
JOSEPH WEICHEL,
Committee.

CLASS 63.

No. 986.	Alexander Speer & Sons, hoe harrow, ...	Diploma.
	The spring tooth float harrow, S. B. Olein & Co., of Perry, New York, which we consider an improvement on the old form of spring harrows, in form of spring and mode of attachment, we recommend	Special mention.
No. 987.	Kimberlin Manufacturing Company, Indianapolis, Indiana, Schatch harrow. Exhibits the Iron Duke harrow, with iron and steel frame, and adjustable teeth, which may be adjusted to various lengths and angles, . .	Diploma.
	Nellis, McIntire & Co., Pittsburgh, adjustable double spring harrow, which we consider an improvement, and recommend a	Diploma.

C. HENRY RONEY, *Chairman,*
SAMUEL PATTERSON,
JOSEPH WEICHEL,
Committee.

CLASS 64—PLANTING AND SOWING.

No. 997.	Duff, McKean & Co., Pittsburgh, force feed grain drill, ...	Silver medal.
	J. W. Scott & Co., Pittsburgh, Buckeye grain drill with fertilizer attachment; we recommend for improvement in saving fertilizers, . .	Bronze medal.
No. 998.	John Henkel, Pittsburgh, hand broad-cast sower,	Diploma.
No. 999.	Nellis, McIntire & Co., Pittsburgh, hand broadcast sower, . .	Bronze medal.
No. 1001.	Scobie, Harrison & Co., Pittsburgh, horse cornplanter, manufactured by A. B. Farquhar, York, Pennsylvania, ...	Bronze medal.
	John Henkel, Pittsburgh, Challenge corn drill,	Special mention.

Prem. list.		
	J. W. Scott & Co., Pittsburgh, lime and fertilizer spreader; we recommend	Special mention.
No. 1004.	Gillespie, Bro. & Co., Pittsburgh, implement for setting out young plants. The exhibit seems a useful improvement; we recommend	Special mention.
No. 1005.	J. W. Scott & Co., Pittsburgh, hand drill seed planter,	Diploma.

We also examined the following exhibits in Class 63, and make the following report:

Plow with an adjustable reversible point by Joseph Elcock, Mechanicsburg, Pennsylvania, which affords an easy mode of keeping the plow point sharp for a long time; recommend	Special mention.
Collection of reversible slip plow shoes and points which have small reversible steel points which may be easily and cheaply replaced as fast as worn out; we recommend	Special mention.

C. HENRY RONEY, *Chairman.*
SAMUEL PATTERSON,
J. B. BEATTY,
JOSEPH WEICHEL,
Committee.

CLASS 65—MOWING AND REAPING.

Frank Johnson & Co., Pittsburgh, Eureka mowing machine,	Silver medal.
Duff, McKean & Co., Pittsburgh, Johnson's harvester and binder,	Silver medal.
Bradley & Co., Syracuse, New York, Bradley mower,	Bronze medal.
Reed & Smith, Pittsburgh, Walter A. Wood reaping machine with cord binder, second premium,	Bronze medal.
Duff, McKean & Co., Johnson Continental reaper,	Silver medal.
J. W. Scott & Co., Pittsburgh, reaping machine, second premium,	Bronze medal.
Duff, McKean & Co., Pittsburgh, grain cradles,	Diploma.
Duff, McKean & Co., Pittsburgh, collection mowers and reapers combined,	Diploma.
Duff, McKean & Co., hay tedder,	Bronze medal.
Remington Agricultural Works, Ilion, New York, Burdick hay tedder,	Silver medal.
C. Bollinger, Harrisburg, horse hay rake,	Bronze medal.
Duff, McKean & Co., Pittsburgh, collection horse hay rakes,	Diploma.
Nellis, McIntire & Co., Pittsburgh, hay fork and fixture,	Bronze medal.
Alexander Speer & Sons, Pittsburgh, potato digger,	Silver medal.
Scobie, Harrison & Co., Pittsburgh, potato digger,	Bronze medal.
Otsego Mills Fork Company, Girard, Pennsylvania, hay fork,	Diploma.

To the President and Members of the Executive Committee:

GENTLEMEN: The committee on Group 23, Classes 65 and 66, report that they have attended to the duties of their appointment. Each member has heretofore served as a member of a committee at State or county fairs, and are gratified to be able to say that they find great improvements, especially in the manufacture of mowers, reapers, and self-binders, and entertain the hope that the day is not far distant when the self-binding reaper will come into as general use on our small farms for the gathering of crops, as the steamer is for threshing of it.

They have given to the exhibitors the most patient attention, while they pointed out and explained the improvements made upon their respective exhibits, and could but draw the conclusion that they were so nearly equal in the perfection in which they cut, gather, butt, and tie the sheaves, that it was very difficult to decide as to the absolute superiority of the one over the other. They can only say that they have used their best efforts to make impartial awards. They have found the same steady improvements in hay rakes and hay tedders.

The committee have long felt that there was room for improvement in the grain drill, inasmuch as almost on every drill the tooth will, without some further guard than as at present arranged, bury much of the grain at unequal depths. This difficulty the committee think has. in a great measure, been overcome by a cheap and effective apparatus invented and patented by Mr. Hamilton, of the Pennsylvania State College, Centre county, and known as the Seed Drill Regulator, that will govern the depth to which the tooth can run into the ground, and which can be attached to any drill, and is exhibited now for the first time. The improvement consists of a roller attached to each tooth that can be set to drop the grain at any depth desired.

The committee are not authorized to award any premium under their list, but respectfully recommend (as it is the only instance in which they depart from the rule,) that a gold medal be awarded Mr. Hamilton by the Executive Committee.

A. O. Heister,
C. P. Dull,
S. B. Allison,
Committee.

CLASS 67—Dairy Fittings and Appliances.

Vermont Farm Machine Company, cream raising vat,	Bronze medal.
A. H. Reid, Philadelphia, creamery,	Silver medal.
A. H. Reid, Philadelphia, butter workers,	Bronze medal.
A. H. Reid, Philadelphia, butter print self guaging,	Bronze medal.
A. H. Reid, Philadelphia, shipping boxes,	Diploma.
J. W. Scott & Co., Pittsburgh, churn,	Bronze medal.

James Miles, *President:*

Your committee respectfully submit the foregoing report, having made our awards so far we feel we have taken into consideration all the merits of the exhibits as recorded.

David H. Branson,
J. S. Keller.

CLASS 69—Flour and Feed Making.

Duff, McKean & Co., Pittsburgh, new model vibrator separator,	Silver medal.
J. W. Scott & Co., Pittsburgh, threshing machine with separator,	Bronze medal.
Scobie, Harrison & Parker, Pittsburgh, portable grist-mill,	Bronze medal.
R. L. Orr, Pittsburgh, Nos. 1, 2, and 3, Standard farm feed mills,	Bronze medal.
J. W. Scott & Co., Pittsburgh, potato, corn, and cob crusher,	Diploma.

J. W. Scott & Co., Philadelphia, Power corn sheller,	Bronze medal.
J. W. Scott & Co., Pittsburgh, Manual corn sheller,	Diploma.
Duff, McKean & Co., Pittsburgh, hay cutter,	Diploma.
Scobie, Harrison & Co., Pittsburgh, corn stalk cutter,	Diploma.
Duff, McKean & Co., Pittsburgh, corn baskets,	Diploma.
Duff, McKean & Co., Pittsburgh, grain measures,	Diploma.

CLASS 70—FIBER MANUFACTURING.

Cooper & Conard, Philadelphia, silk loom,	Silver medal.
West Keystone Knitting Company, Pittsburgh, Power knitting machines,	Silver medal.
Henry Mitchell Paterson, New Jersey, silk loom,	Diploma.

JAMES MILES, *President:*

We, the undersigned committee on Classes 69 and 70, respectfully submit the above.

B. F. ISENBERG,
JACKSON HARMAN,
G. C. THORNTON.

CLASS 72—PREPARING OTHER PRODUCTS.

J. L. Baker & Son, Dayton, Ohio, cider-mill,	Bronze medal.
Fairbanks & Co., weighing machine for general farm purpose,	Bronze medal.
Fairbanks & Co., platform scales for hay and cattle,	Silver medal.
Fairbanks & Co., collection large and small scales,	Bronze medal.
William Croft, Allegheny, fruit dryer,	Bronze medal.
Scobie, Harrison & Co., Pittsburgh, hay press,	Bronze medal.

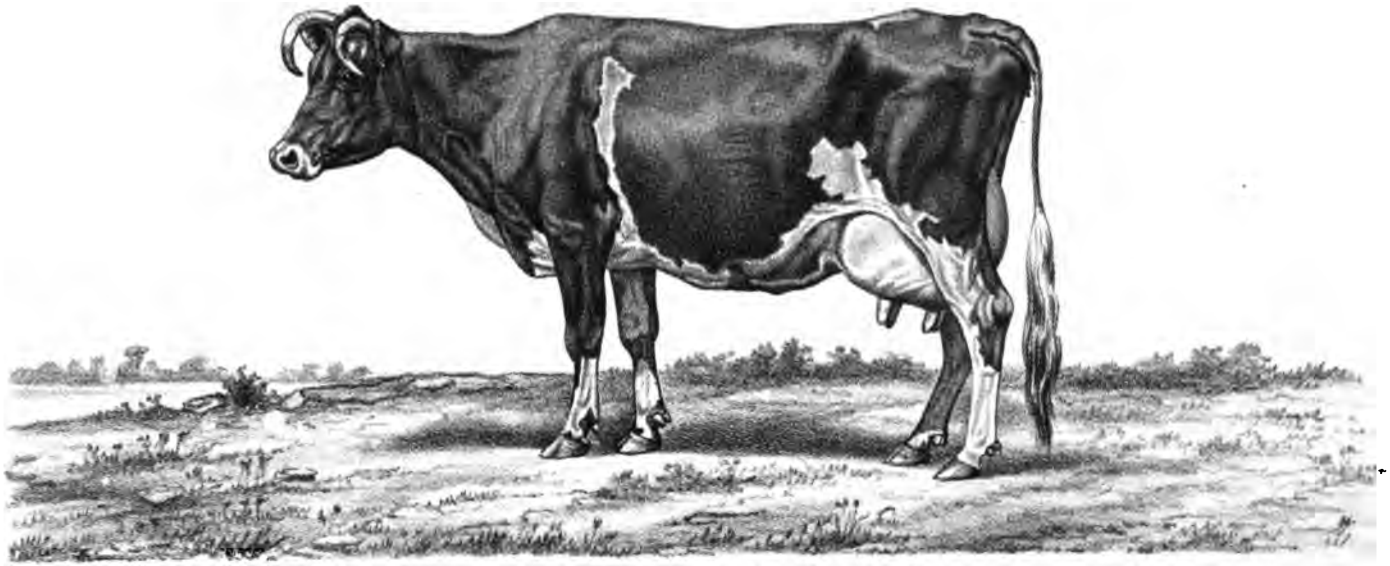
JAMES MILES, *President.*

SIR: Your committee appointed to judge in above classes, beg leave to submit this, their report.

DAVID H. BRANSON,
ISAAC ACKER.

CLASS 73—BUSINESS VEHICLES.

J. W. Scott & Co., Pittsburgh, cart for hauling manure,	Bronze medal.
J. G. Weir, Pittsburgh, dray for heavy loads,	Diploma.
J. G. Weir, express or heavy business wagons,	Bronze medal.
J. G. Weir, collection of express or heavy business wagons,	Silver medal.
Lange & Woefel, Pittsburgh, wagons,	Bronze medal.
White & Little, Allegheny, road or business wagons,	Bronze medal.
White & Little, collection of road and business wagons,	Silver medal.
J. W. Scott & Co., Pittsburgh, farm wagon,	Bronze medal.
Logan, Gregg & Co., Pittsburgh, Jackson manufacturing steel and iron wheelbarrows,	Silver medal.
Duff, McKean & Co., Pittsburgh, bob sleds,	Diploma.
Frank Johnson & Co., Allegheny, Pennsylvania, buggies and buck wagons,	Diploma.
C. W. Coleman, Pittsburgh, rockaway wagons,	Diploma.
C. West & Co., Pittsburgh, broughams or close carriages, standing tops,	Bronze medal.
C. West & Co., rockaways,	Bronze medal.
C. West & Co., phaetons,	Bronze medal.
C. West & Co., collection of top and no-top buggies,	Silver medal.



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"COOMASSIE," No. 11.874.

Owned by S. M. Burnham, Songatuck, Conn.

L. Glessenkamp & Co., Pittsburgh, close carriage, folding top,	Bronze medal.
L. Glessenkamp & Co., collection of close carriages, folding tops,	Silver medal.
L. Glessenkamp & Co., collection of phaetons, &c.,	Silver medal.
L. Glessenkamp & Co., collection of buggies,	Bronze medal.
L. Glessenkamp & Co., collection of two-wheeled vehicles,	Silver medal.
L. Glessenkamp & Co., sleighs, one and two horse,	Bronze medal.
L. Geissenkamp & Co., sleighs, one and two horse,	Diploma.

Your committee, after a careful examination, respectfully make the foregoing awards. The excellence of workmanship, beauty of design and finish, and durability combined in the exhibit of business wagons, carriages, &c., is of such a character as to preclude any special mention, and your committee takes special pleasure in pronouncing this year's display the finest ever gathered together by the State Association.

IRA TRIPP,
W. W. BOYER,
WM. SHEESLEY,
DAVID M. DONEHOO,
Committee.

JAMES MILES, *President Pennsylvania Agricultural Society.*

CLASS 75—BUILDINGS AND FENCING.

Nellis, McIntyre & Co., Pittsburgh, ornamental iron and gate posts,	Bronze medal.
James R. Taylor & Co., Pittsburgh, iron railing,	Diploma.
Hopkins & Steiner, Allegheny, locks, knobs, and butt hinges,	Diploma.
Prentice & Hackett, Pittsburgh, artificial stone for building ornamentation,	Bronze medal.
Smith & Dean, Pittsburgh, fire-escape and builders' elevator,	Diploma.
J. R. Fricke & Co., Pittsburgh, vanes and lightning rods,	Diploma.
R. M. Slaymaker, Lancaster, Pennsylvania, farm gate,	Diploma.
Cincinnati Safe and Lock Company, collection of iron safes,	Bronze medal.

CLASS 76—ROADS, WALKS, AND ENCLOSURES.

Prentice & Hackett, Pittsburgh, artificial stone for paving roads,	Bronze medal.
Prentice & Hackett, pottery for garden edging, flower pots,	Silver medal.
Prentice & Hackett, rustic work for gardens and lawns,	Bronze medal.
Elverson, Sherwin & Barker, New Brighton, Pennsylvania, plain and fancy flower pots,	Bronze medal.
J. R. Taylor & Co., Pittsburgh, rustic work for gardens and lawns,	Diploma.

JAMES MILES,
President Pennsylvania Agricultural Society:

The committee, to whom was referred the awarding of premiums for exhibits in Classes 75 and 76, after a careful examination of all the articles in said classes, respectfully submit the above as their awards.

L. A. MACKEY,
J. B. G. KINSLOE,
Committee.

CLASS 77—FURNITURE OF WOOD.

Oliver, McClintock & Co., Pittsburgh, parlor, hall, and library furniture,	Silver medal.
H. Adler, Pittsburgh, sheet-metal fender and coal passes,	Bronze medal.
Oliver, McClintock & Co., Pittsburgh, upholstering,	Silver medal.
Noble & Co., Pittsburgh, bedding,	Silver medal.
McGilvray & Co., Allegheny City, display of furniture.	Silver medal.

Your committee on this class recommend the exhibit of Messrs. A. McGilvray & Co., of Allegheny City, of drawing-room furniture, as in its judgment the most complete of its class ever seen at this or any of our previous exhibitions. The designs were unique and exceedingly tasteful, and the work of the highest mechanical order. The patterns and material are likewise artistic, and composed of the best goods in this specialty.

IRA TRIP, *Chairman*,
W. B. TILL,
ELBRIDGE MCCONKEY.

CLASS 81—HOUSEHOLD MACHINES.

H. A. Kunze, Allegheny, Wilson sewing machine,	Silver medal.
Lore Sewing Machine Company, Lore sewing machine for button hole work,	Bronze medal.
West Keystone Knitting Company, Pittsburgh, hand knitting machine,	Bronze medal.
H. S. Bingham, Onskarry Falls, New York, steam washing machine,	Bronze medal.
Samuel Reed, Pittsburgh, clothes wringer,	Diploma.

Your committee beg leave to report that careful examination has been made of all articles in their department, and make the foregoing awards.

W. H. HOLSTEIN, *Chairman*,
MRS. C. M. REED,
MRS. OTTO F. SEELANS,
COLIN M. REED.

JAMES MILES, ***President:***

Your committee engaged the services of Mr. Tweed, a practical machinist, and with him a very thorough examination of the machines was made in all their parts. We might add that all the sewing machines did their work well and very satisfactorily.

W. H. HOLSTEIN,
Chairman for the Committee.

CLASS 82—STOVES AND HEATERS.

A. Moore, Allegheny, ornamental grates,	Diploma.
Bissell & Co., Pittsburgh, ornamental grates,	Bronze medal.
Bissell & Co., stone, marble, and tile ornamental mantles,	Silver medal.
Bissell & Co., stove for heating cars,	Silver medal.
Alexander Beggs & Son, Anderson, Ohio, stone and marble mantles,	Bronze medal.
Graff, Hugus & Co., Pittsburgh, portable heater,	Silver medal.
Graff, Hugus & Co., hard coal base burner,	Diploma.
J. C. Bartlett, Pittsburgh, warm air furnace,	Bronze medal.
H. Anshutz & Co., Pittsburgh, parlor stove,	Bronze medal.
H. Anshutz & Co., portable heater,	Bronze medal.

CLASS 83—CULINARY APPLIANCES.

Graff, Hugus & Co., Pittsburgh, kitchen range,	Bronze medal.
Bissell & Co., Pittsburgh, kitchen range,	Silver medal.
Bissell & Co., kitchen stove for bituminous coal,	Bronze medal.
Spaulding & Richards, Pittsburgh, gasoline cooking stoves,	Bronze medal.
Spaulding & Richards, monitor oil stoves,	Diploma.
H. Anshutz, & Co., Pittsburgh, kitchen stove,	Diploma.

CLASS 84—VENTILATION.

W. R. McDonald, Allegheny, heating apparatus,	Silver medal.
W. R. McDonald, ventilating attachment for heater,	Diploma.
W. R. McDonald, arrangement for removing and disinfecting sewer gas,	Silver medal.

JAMES MILES, *President:*

Your committee were deeply interested in their examination of the articles submitted to their inspection. They were all of a high degree of merit, and it has been with extreme diffidence we have awarded the premiums.

If we have awarded any premium which does injustice to an exhibitor, it must be set down to our want of knowledge pertaining to those matters, and the limited time allotted to us for examination and investigation.

GEORGE RHEY,
S. B. MERCER.

CLASS 85—ARTIFICIAL ILLUMINATION.

J. M. Bauman, agent, Pittsburgh, welcome removable ratchett burner,	Diploma.

CLASS 89—CHEMICALS.

B. S. Fahnestock, Pittsburgh, baking powder,	Diploma.
Lynch & Tetzel, Allegheny, paints and varnish,	Diploma.

JAMES MILES, *President:*

Your committee beg leave to submit the above awards.

D. H. BRANSON,
ISAAC ACKER,
D. T. WILSON,
J. WILSON.

CLASS 86—SUPPLYING WATER TO BUILDINGS AND GROUNDS.

A. F. Dalzell, Pittsburgh, pressure filterer,	Bronze medal.

CLASS 87—DRAINING.

Prentice & Hackett, Pittsburgh, McMahon, Porter & Co.'s sewer and drain pipe,	Bronze medal.

CLASS 90—EDUCATIONAL MEANS AND INCENTIVES.

Buffalo Hardware Company, Buffalo, New York, new paragon school desks,	Bronze medal.
G. Freeborn & Sons, Allegheny, Sunday school desks,	Diploma.

DAVID TAGGART, *Chairman.*

CLASS 92—CARVED AND MOLDED.

Prentice & Hackett, Pittsburgh, designs in pottery for gardens and lawns,	Silver medal.
Elverson, Sherwin & Barker, New Brighton, Pennsylvania, terra-cotta, lawn, ornamental vases, and ware, . .	Diploma.
Young & Van Gunden, Allegheny, marble and granite work,	Silver medal.
M. L. Taylor, Pittsburgh, models of fruit and flowers in wax, ...	Diploma.
M. L. Taylor, broken column, preserved flowers, ...	Diploma.
M. L. Taylor, cross, preserved flowers, ...	Diploma.
M. L. Taylor, pillow, preserved flowers, ...	Diploma.
M. L. Taylor, cross and anchor of wax lillies, ...	Diploma.
M. L. Taylor, specimen of roses, . . .	Diploma.

The committee would recommend in lieu of diplomas for Mrs. Taylor, a silver medal, embracing the whole exhibit, which is certainly very deserving.

CLASS 93—ON PAPER AND CANVAS.

W. W. McClelland, Pittsburgh, card writing and penmanship, ...	Diploma.
E. G. Bertoberger, Pittsburgh, wood engraving, ...	Diploma.
B. L. H. Dabb, Pittsburgh, colored photographs,	Silver medal.
Chandler & Sheetz, Philadelphia, best collection photographs,	Silver medal.

The committee respectfully make report as noted in this book, and are unanimous in our conclusions.

DAVID H. BRANSON,
ISAAC ACKER,
EDWARD P. KEARNS.

CLASS 96—UNCLASSIFIED.

F. & J. Heinz, Pittsburgh, pickel assorter, ...	Diploma.
R. L. Orr, Pittsburgh, standard saw gummer, ...	Diploma.
Prentice & Hackett, Pittsburgh, cement, ...	Diploma.
J. R. Frick & Co., Pittsburgh, copper wire cables, . . .	Diploma.
Hopkins & Steiner, Allegheny, Norton's sash chains, . . .	Bronze medal.
Hopkins & Steiner, Morris' Sash Lock Company, locks, .	Bronze medal.
Hopkins & Steiner, Wollensak transom lifters, . . .	Bronze medal.
Hopkins & Steiner, display of hardware, ...	Bronze medal.
Hopkins & Steiner, collection of bird cages, .	Diploma.
Excelsior Manufacturing Company, Pittsburgh, pump for taking oil from barrels, ...	Diploma.
Solderless Standing Seam Conductor Company, Allegheny, expanding water conductor, ...	Silver medal.
J. B. Kercher, Pittsburgh, general hardware, .	Diploma.
Ewing, Mitchell & Co., Pittsburgh, mill, mine, and railroad supplies and tools, ...	Bronze medal.
Austin, Opdyke & Co., Philadelphia, expanding water conductor, ...	Bronze medal.
James D. Carlisle, Pittsburgh, patent shirts, ...	Diploma.
E. Lindsay Greer, Pittsburgh, asbestos goods, ...	Diploma.
A. Papenback, Pittsburgh, hand-made horse shoes, ...	Diploma.
John P. Reinicke, Pittsburgh, safety oil tank, ...	Diploma.
Benjamin Firman, Pittsburgh, writing fluid, ...	Diploma.

E. Russell, Pittsburgh, hair goods,	Diploma.
J. R. Johnson, Downingtown, Pennsylvania, Excelsior oil blacking,	Diploma.
W. G. Hoover, Pittsburgh, improved ventilating insoles for boots or shoes,	Diploma.
William Croft, Allegheny, fruit dryer,	Diploma.
Nellis, McIntire & Co., Pittsburgh, post-hole auger,	Diploma.
Ideal Coffee Pot Company, Philadelphia, coffee urns, boilers, and hot-water urns,	Diploma.
Novelty Manufacturing Company, Pittsburgh, frogs,	Diploma.
Gillespie, Brother & Co., Pittsburgh, Artesian well apparatus,	Bronze medal.
Gillespie, Brother & Co., Pittsburgh, Artesian well tools,	Diploma.
Gillespie, Brother & Co., Pittsburgh, post-hole diggers,	Diploma.
A. F. Dalzell, Pittsburgh, revolving bolt and screw case,	Diploma.
A. F. Dalzell, Pittsburgh, locomotive automatic cylinder lubricator,	Diploma.
R. F. Dalzell, Pittsburgh, automatic pin oiler,	Diploma.
J. R. Frick & Co., Pittsburgh, electro gold plate groups, branches, points, &c., for lightning rods,	Diploma.
J. F. Watt, agent, Pittsburgh, silver polish,	Diploma.
John A. Hafner, Pittsburgh, display of Eureka coil springs, equilibrium driving pulley for mill spindles, friction clutch, &c.,	Diploma.
James A. Brown, Philadelphia, Japan, Chinese, and Turkey curiosities,	Diploma.
Hugh McDonald, Pittsburgh, furnace shield,	Diploma.
Winfield Manufacturing Company, Warren, Ohio, oil tanks, measuring pumps, and oil cans,	Diploma.
Marchant Manufacturing Company, Pittsburgh, automatic liquid measure,	Diploma.

Respectfully submitted.

DAVID TAGGART,
Chairman.

REPORTS ON THE DEPARTMENTS OF THE EXHIBITIONS AT PITTSBURGH, 1882.

DEPARTMENT I—Live Stock.

Horses—Heavy Draught.

The heavy draught class was well filled, and some of the animals of a very high order. Clydesdales were in the largest numbers, and grand horses of this breed were shown. The most conspicuous were Duke of Dunblane, five years old, a bay horse of magnificent proportions, owned by Carr & Martin. Brown Prince, a three year old, a remarkably promising one, and Sir Charles, a solid substantial colt.

Maizland's Prince Charles, a horse of immense power and substance, attracted much attention.

Mr. Bott's stallion Crown Prince, a most imposing looking horse, moved his ponderous bulk with the activity and lightness of a coach horse.

Mr. George showed six fine fillies, and Mr. Park, Rose Bud and Heather Bell, both meritorious.

Lenhart's four-year-old brown stallion Dawn of Liberty, and his Percheron stallion Chounard, three years old, deserve notice.

Mr. Frank Arday's white Percheron stallion Bijou, seven years old, was one of the very best specimens of heavy draught on the show grounds.

De Le Pierre, another Percheron, jet black in color, a very solid useful horse, was exhibited by Mr. D. Sutton.

There were a number of cross-bred draught horses on exhibition, many of them showing a strong admixture of Clydesdale, an infusion of blood that proves its worth in the increased weight of bone and carcass. Indeed, we think the produce of our roomy native mares by Clyde or Perche stallions preferable as work horses to the pure breed of either race, as being better able to endure the fervid heat of our long summers.

Cattle.

SHORT HORNS.—As usual the breeders of the State of Ohio were the leading contributors at our fair. The exhibit was not as large as at either of the Philadelphia or the preceding Pittsburgh fairs, but the quality was about the same.

J. B. Anderson, of Anderson, Ohio, was the prominent exhibitor. His heard of ten was in the pink of condition. It was headed by the splendid bull "Springdale Airdrie," massive, level, and symmetrical—a bovine king. Among the most noticeable females in his herd were the cows "Jennie May," "Mayflower," "Minnie Springdale," and, a yearling heifer, "Pink Springdale."

Mr. J. S. Steel, Anderson, Ohio, had eight head, with the bull "Young Airdrie" at the front, an animal of very high type. Particulary noticeable among the females were the cows "Matilda 8th," "Daisy Dean," "Nellie Sharon 2d," and the heifer "Gracie."

D. H. Eberly, of Greensburg, Pennsylvania, showed the bull "Duke of Wheatland," the cow "Roan Belle," with some others of moderate quality.

HEREFORDS.—Only one exhibitor in this class, Mr. E. G. Merryman, of Cockeysville, Maryland. His herd of seven were excellent animals, and clearly showed their merits as a beef breed. The bull, "Prince of Wye," a very level animal, and a fine handler. The cows, a uniform lot, neat and bloodlike. We particularly admired "Princess Charlotte," "Bonnets o' Blue," and "Lady President."

DEVONS.—The entire exhibit in this class was of a high order of excellence. The herds of D. & J. Banker, Franklin Forks, Pennsylvania; J. B. Longnecker, Union Deposit, Pennsylvania; J. M. Miller, Washington county, Pennsylvania; and D. J. Whitmore, Casstown, Ohio, were the competitors—in all about thirty head—the largest show of this breed that we ever remember seeing at the State fair.

Mr. Longnecker's bull, "Puritan, 3d," and cows, "Mountain Maid" and "Helena, 52d," deserve a more than passing notice. Mr. L——'s cattle have remarkably fine waxen horns. This seems to be an especial characteristic of this herd. They are further distinguished by an occasional white patch on the fore udder, which, though some hypercritical judges object to, is a breed-mark pertaining to some very high caste families of North Devon cattle.

D. & J. Banker's "Rose of Baltimore" and "Bright Promise, 4th," very superior. J. M. Miller's "Luna" and "Lena" were among the best of his lot, which is according them high praise.

The herd of Mr. Whitmore contained many good and useful animals, and was very even in quality.

AYRSHIRES.—A. J. Wilson, Grafton, Ohio; W. Fairweather, McLane, Pennsylvania; and C. Steffen, Allegheny, Pennsylvania, were the only contestants in this breed.

Mr. Wilson showed a well-bred herd, among the most noteworthy were the cows "Annie" and "Honesty," the latter a two-year of remarkable merit. We never remember seeing a heifer of this breed that gives as good promise in the essentials of a dairy and show animal, the only drawback being a preponderance of white in color.

The bull, "Forester," is a fine Ayrshire type. He would be improved, however, by being a trifle more rangey.

Mr. Fairweather was out in strong force, not only in number, but in quality. The bull, "Excelsior," headed his herd, and well deserves his name—undoubtedly, the best Ayrshire bull that has yet put in an appearance at our State fair.

We especially liked "Mollie Pender" and "Lady Pender," the latter imported, twelve years old, but a noted cow in her day. Mr. Fairweather showed some very nice yearlings and two-year-old heifers, which received recognition at the hands of the judges. He exhibited twelve head in all.

HOLSTEINS.—As an evidence of the popularity of this comparatively newly introduced breed, we may state that in the number shown it exceeded any other race of cattle on the grounds. If it is possible to combine beef and milk in the same animal, the Holstein certainly comes nearest the mark. With an udder development rivaling the best of the milking breeds, and a size and aptitude to fatten approaching the Short-Horn, it is no wonder that it is popular with breeders and farmers who are looking for a general utility animal.

Mr. Edgar Huidekoper, Meadville, Pennsylvania; L. Henderson, Washington county, Pennsylvania; A. J. Sutton, Indiana county, Pennsylvania; Brooks & Totter, Salem, Ohio; and R. G. Taylor, Bethlehem, Pennsylvania, were the exhibitors.

Among the best animals, we may mention the bulls "Billy Boleyn," "Anton," "Prince Opperdoes," "Shadeland Prince," and "Joe Katzmeister;" and the cows "Hykolina," "Alletta Twisk," "Colleen Bawn," "Hylkea," "Onondago Princess Katinka," "Cecelia," and "Black Bessie."

JERSEYS.—Were of only moderate quality as a whole. The exhibitors were A. M. Carr, of Salem, Ohio, who had six on show; A. M. Risher, Hope Church, Pennsylvania, with ten head; and J. K. Dain, Freeport, Pennsylvania, with fourteen.

The most noteworthy were Mr. Carr's bull, "Ursa Major," a fine-boned level animal; the handsome cow, "Ninon's Pet;" and a very neat heifer named "Sea Gull's Pride."

The best of Mr. Risher's was the two year old heifer "Fairy Cherry." The cows "Polynia" "IXL.," and "Prudence of Bovina" were fairly good.

The prominent animals in Mr. Dain's herd were the yearling bull "Young Willie," the cows "Martha of Highland" and "Dolly Perkins," and the heifers "Emma B." and "Patty Rogers."

GUERNSEYS.—These were in small number, but some very fair specimens. A. M. Carr had an exceedingly nice bull calf, and a very choice heifer.

J. M. Fox, Foxburg, Pennsylvania, a very fair bull; and two cows, "Fan" and "Frolic," that were excellent milkers.

Sheep.

AMERICAN MERINOES.—Not in very large numbers, but high in merit. The principal exhibitors were John Pow, Salem, Ohio; William A. Herriott, Oakdale, Alllegheny county, Pennsylvania; John Perrine, Washington county, Pennsylvania; John M. Miller, Washington county, Pennsylvania; Button Brothers, of Chittenango, New York.

BLACK-TOP MERINOES.—The Black-Tops have less grease in their wool; consequently, present a cleaner appearance than their relatives, the American Merinoes. They are also free from the heavy folds of skin; therefore, more easy to shear.

J. G. Paxson, Houstonville, Pennsylvania, showed four rams and nine ewes of this variety; Joseph Willison, same place, an equal number; William Berry, Washington county, Pennsylvania, a lot of nice ewes and some fat wethers.

SOUTHDOWNS.—Few exhibitors. R. M. Fisher showed some of the best. J. C. Comfort also had some good ones, and W. N. Black, Danville, Kentucky, had two pens of fat Southdown wethers that were in the very highest condition. W. D. Anderson, Anderson, Ohio, and Edward Hicks, Goshenville, Pennsylvania, were also distinguished exhibitors.

COTSWOLDS.—Edward Hicks, Goshenville, Pennsylvania; C. H. Ballinger, Atwater, Ohio; and T. F. Dickson, Mercer county, Pennsylvania, entered the lists for competition. Where merits were as closely balanced as in this instance, it would be invidious to draw comparisons—their exhibit was capital throughout.

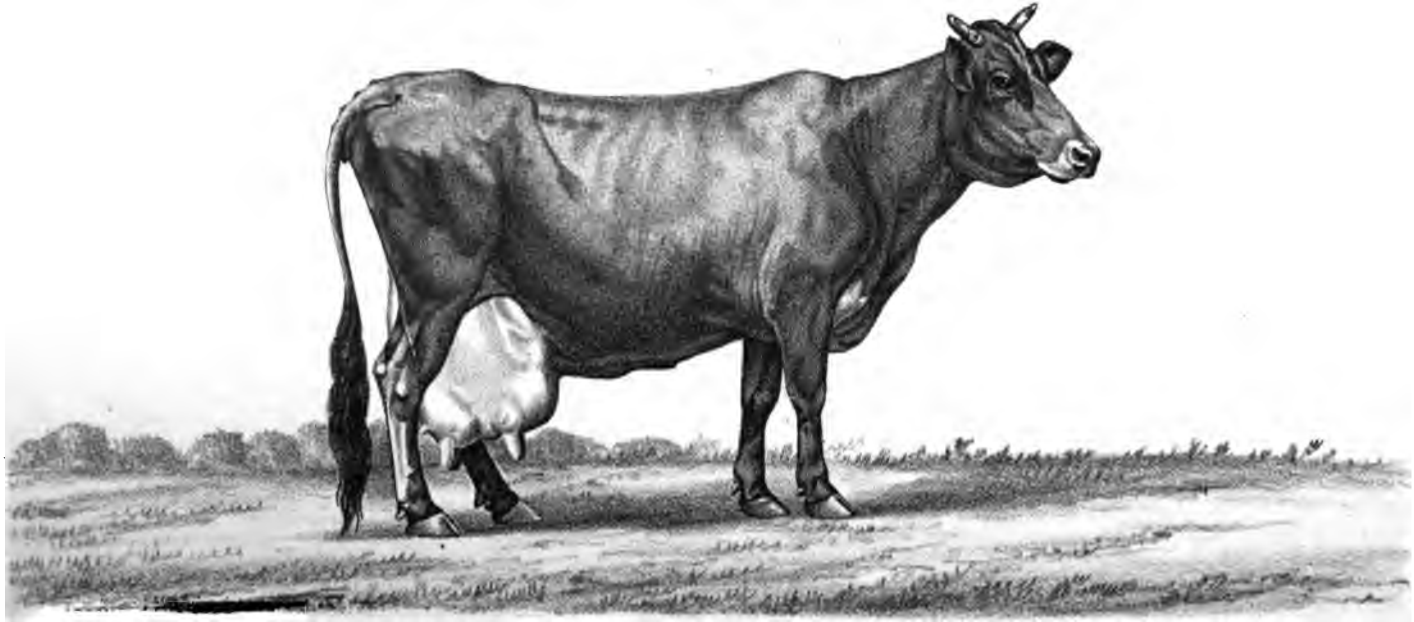
SHROPSHIREDOWNS.—Mr. C. H. Ballinger, Atwater, Ohio, came to the front with a magnificent lot.

Swine.

This was one of the best filled classes in the Live Stock Department, and the quality well maintained throughout.

Chester Whites were in the largest number, about two hundred being on show.

Jefferson Shaner, E. B. Ashbridge, and T. Walters & Son represented Chester county, the home of the breed. As the gentlemen are among the



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"EUROTAS," No. 2454.

Owned by A. B. Darling, Ramsey, N. J.

acknowledged leading breeders of this race, the quality of their exhibit may be readily inferred. Mr. R. Dutton, of Milltown, Pennsylvania, also had some very creditable animals.

Berkshires.—A very well filled class. The principal exhibitors were Jefferson Shaner, of West Chester, Pennsylvania; A. J. Todd, Beaver, Pennsylvania; H. F. Henderson, Portage county, Ohio (who showed thirty-one head); M. Evans, Allegheny, Pennsylvania; J. L. Henderson, Washington county, and T. Walters & Son, of West Chester, Pennsylvania.

Poland Chinas.—Only two breeders showed in this class, Samuel Cameron, Beaver, Pennsylvania, and Richard Dutton, of Milltown, Pennsylvania. Both gentlemen had first rate specimens on show.

Jersey Reds.—Mr. J. L. Mustard, Van Buren, Pennsylvania, had the only swine of this breed that were worthy of notice. They were really good.

Essex.—One herd was shown, (fifteen head;) very good; J. R. McMasters, owner.

Cheshire Swine.—Button Bros., Chittenango, New York, showed several pens of this variety, which they claim is a distinct breed, and capable of reproducing its type without deviation. The Cheshire is a white hog, of medium size, erect ears, finely, *i. e.*, thinly haired, fine-boned, carcass lengthy and round.

They urge that a separate class be made for it on our prize list, and if it possesses the merit and individuality that they claim for it, it seems only fair that it should be accorded the same rights and privileges that have elevated the Chester Whites and Poland Chinas into the standard and dignity of pure breeds.

Poultry.

Early September is an unsuitable time for a poultry show, old fowls at that period are in deep moult, their combs and wattels shrunken, the birds presenting a ragged, dejected, and woe-begone appearance, which, to a great extent, nullifies points and breed marks. This, of course, does not apply to fowls under a year old, if they are sufficiently early hatched to be fully grown and developed.

Asiatics.—White Brahmas were the best of this class. The Dark Brahmas and Buff Cochins, very moderate as a whole.

Games.—Very few standard bred, though probably good pit fowls.

Spanish.—White-faced Black, few and inferior. White Leghorns, very ordinary. Brown Leghorns, no better.

Polands.—Silver and Golden the best of this class and superb birds.

American.—Some fair Plymouth Rocks.

Hamburgs.—Golden Spangled, inferior. Golden Penciled, moderate in quality. Silver Spangled, fairly good. Silver Penciled, inferior.

Bantams.—Game Bantams in the Black Red, Duck Wing, and Pyle classes, some very fine birds, and fairly good in Golden and Silver Seabrights. Taking the Bantam class throughout, it maintained its average better than any of the other families.

Of Turkeys, a few good pens of Bronze.

In aquatic fowls we noticed some good coops of Toulouse and China Geese.

The Pigeon exhibit was highly creditable.

DEPARTMENT II—Farm and Garden Products and their Manufacture.

In this department, embracing so many fine exhibits of the best of their class, it will be necessary to take up each one separately. While mention may not be made of all, it will be for want of space that each exhibitor is not complimented in assisting to make a display that may have been equalled, but never excelled by any society.

GROUP VIII—Dairy Products.

CLASS 33.—This Society, for the past five or six years, always relied upon the active coöperation of the Pennsylvania State Dairymen's Association, and they this year made a display from a dozen of factories and individual firms engaged in the manufacture of cheese of all the well-known varieties. The Summit, Venango, Cole, Nash, Beaver Centre, Spring Valley, Linesville, Warren, French Creek, and Woodcock factories each had, in themselves, a fine exhibit.

The exhibit of butter was not large, and confined to but five exhibitors, all of whom showed print butter.

GROUP IX—Wool.

Mr. John McDowell, of Washington, Pennsylvania, made a very fine exhibit of fine wool in case. Also, James Willison, of Houstonville, Pennsylvania.

In long wool, E. Walters & Son, of West Chester, and Edward Hicks, of Goshenville, Pennsylvania, were the fortunate exhibitors. It was expected that the display in this class would have been large, from the fact of the close proximity to a large wool-growing section, but, for some unaccountable reason, that interest was not manifested by the persons who are most interested in this branch of industry.

CLASS 35.—The display of J. & H. Philips, of Pittsburgh, of rubber goods, oil-cloths, &c., was one of the largest and best in the building, the arrangement reflecting credit upon this firm, and they deserved not only the medal awarded, but the thanks of the Society for their very handsome display.

The displays of apparel—clothing, hats, boots and shoes, millinery goods, embroidery—by the merchants of Pittsburgh and Allegheny, were of a high order of merit, and to speak of each exhibitor separately would consume more space than is allowed in this article—each exhibitor showing their goods to the best advantage and most attractive style.

J. G. Bennett, of Pittsburgh, displayed his furs of all the several varieties, which were admired by all who passed his exhibit.

James Callery, of Pittsburgh, had on exhibition a very fine show of harness and saddlery leather, to which was awarded a silver medal.

Also, John Davis, of Pittsburgh, with his exhibit of trunks and satchels, to whom the committee awarded a silver medal for his handsome display.

The exhibit of J. A. Borland & Co., of Pittsburgh, of ladies' and gentlemen's boots and shoes was an attractive exhibit, and awarded a bronze medal.

Arthur Frick, of Philadelphia, made his fourth exhibit at the Society's exhibitions, and, as usual, was awarded a silver medal for his large collection of perfumery.

Grand Prizes for Collection under Groups XIII, XIV, XV, XVI.

The very large exhibit of grains, seeds, vegetables, and also of fruits, by the West Fairview Farmers' Club of Cumberland County, Pennsylvania, was beyond dispute the largest and best on exhibition, and the gentlemen composing this organization deserve the thanks of the Society for the trouble, patience, and difficulty they experienced in securing one of the best exhibits of this kind ever shown at the Society's fair.

Grain, Seeds, and Flour.

In this display, the farmers took especial interest, and the articles shown were of a superior kind, among which was that shown by the members of the committee selected at the last fair to take the prize grains, plant them, and report the results. The reports of two of this committee were made, and are published in the proceedings, and it is hoped that the results accruing therefrom will be of great benefit to the farming community.

The exhibits of John McDowell and John L. Mustard, of Washington county; D. L. Branson, of Chester county; J. C. Comfort and George W. Boyer, of Cumberland county; Philip Hess and George Houser, of Dauphin county; and many others, combined to make this department of the exhibition one of the best shown for years.

In class No. 44, but two exhibitors showed their wines—Julius Hincke, of Egg Harbor, New Jersey; and G. E. Ryckman, of Brocton, New York. The latter had a very large and fine display of his wines, while the former had but a dozen bottles, the judges giving to each a medal.

Roots, Tubers, and Bulbs.

Some of the finest samples in this class were exhibited, and to the credit of those who assisted in making this part of the fair one of the attractions, the favorable season assisted the cultivators in their efforts, and their showing was an agreeable surprise to all who interested themselves in this line. J. C. Comfort, The West Fairview Farmers' Club, Preston Brothers, James Gordon, and others, were awarded premiums.

GROUP XV—Fruits and Nuts.

It was thought, on account of the unfavorable season, that the display of fruit would be very small and of an inferior quality. Much to the surprise of the officers and others, the exhibit covered two tables, each three hundred feet long by four feet wide, and these tables were crowded with plates and baskets of the choicest variety and of superior quality, about 2,200 plates in all. Among the most prominent exhibitors were Samuel Nixon, of Woodville, Pennsylvania; J. C. Comfort, Cumberland county; Gabriel Hiester, Dauphin county; S. Cameron, Beaver county; George Boyer, West Fairview; Murdoch Brothers, Pittsburgh; last, and not least, James A. Nelson, of Indian Run, Mercer county, who had over a hundred varieties of apples on exhibition. Many others exhibited in small quantities, which assisted in making a display of fruit that, for the season, was creditable to all.

DEPARTMENT III.

Tools, Implements, and Machinery.

This department of the exhibition deserves especial mention, more particularly that part that belongs more properly to the farming interest. The large display of mowers, reapers, binders, tedders, plows, rakes, drills, and implements for both tilling and planting, and the gathering of the crops, far excelled any exhibition ever given in the western part of this State, and to speak of each one separately would be more than the committees of the several classes could do. Duff, McKean & Co., of Pittsburgh, were awarded the grand prize for the largest collection, and J. W. Scott, of same city, the second prize. By reference to the awards in this department an estimate can be made of the exhibits displayed.

The Harrisburg Foundry and Machine Works, Gillespie Bros. & Co., Pittsburgh, Russell & Co., Reed & Smith, and Geiser Manufacturing Company of Waynesboro', were awarded premiums on portable and farm engines.

Several portable saw-mills were on exhibition and in operation.

The Otto silent gas engine was running all the time, and was a source of wonder to many.

In the display of pumps, Wilson, Snyder & Co., of Pittsburgh, with their usual energy and business-like spirit, had by far the largest display; and the large pump in operation, capable of furnishing two million gallons daily, was an attractive feature. Reinecke Bros., of Pittsburgh, also had a large display of their pumps.

Several large collections of plows were exhibited; that of Alexander Speer & Sons, of Pittsburgh, contained the greatest variety of styles, and the artistic arrangement was of the highest order, and they were awarded the first premium.

The Syracuse Chilled Plow Company, with their usual liberality and energy, made a very fine display, to whom was awarded the second prize.

The other exhibitions in this line showed specimens of their work that reflected credit on their manufactures.

Of reapers, mowers, and binders, this exhibit was of the highest order, and all the principal manufacturers had, through their agents, their machines on exhibition, a great majority being in operation.

The report of the committee on those classes is an exhaustive one, and will repay one, seeking information, by a perusal of it.

The display of dairy apparatus was not up to the usual standard; why this was lacking it is impossible to say, for the past three years the Society encouraged this branch by offering large inducements and succeeded, especially in Philadelphia, in having a grand display of diary appliances.

In flour and feed making machinery it was not expected to have a display equal to that of last year, when, by the coöperation of the State Millers' Association, and their active support, the manufacturers of this kind of machinery filled all the space allotted to them, and made it one of great interest.

Fiber Manufacturing.

Two silk looms were in operation, the one by Cooper & Conard, of Philadelphia, the other by Henry Mitchell, of Paterson, New Jersey, the first weaving patterns for silk dresses, the other handkerchiefs, in which was a view of the exposition building. The working of these intricate machines was viewed by all, and great interest taken in all their operations. The former taking the first prize.

Transportation.

In this department of the exhibition, the display of carriages, business wagons, drays, carts, &c., was by far superior to any exhibition ever given, Messrs. C. West & Co. and L. Glessenkamp & Co., of Pittsburgh, being the chief contributors, and these gentlemen should be proud of their work. The fancy carriages, both two and one-horse, were of the finest workmanship, and the business wagons on exhibition could not be excelled in any city.

One of the most attractive features of the exhibition in the building was the display of furniture, and some of the suits were of the most elaborate workmanship and of the finest material. So, also, was the displays of the dry goods and silverware, from the best-known firms in Pittsburgh.

Taking this as a short description of the contents of the main building, it would not be saying too much when it should be stated that all the exhibits were new, bright, and fresh, and, as a whole, will ever be remembered by all who visited the fair.

DEPARTMENT OF MACHINERY—Henry Green, Superintendent.

This department was largely represented by exhibitors from many of the different States as well as the State of Pennsylvania. The display of agricultural machinery was exceedingly good, embracing all kinds of implements of that class. The steam engines, saw-mills, machine castings, and tools ranked above most of other exhibitions, particularly in finish, some of which were of the most excellent workmanship.

Steam Traction Engines.

Steam traction engines, of Waynesboro', Pennsylvania, was one of the great features in this department during the fair. Being operated on the grounds, under complete control by one man, drawing loads, scraping race course, running saw-mills, and almost anything that a steam engine could be used for. What these engines could do appear to be to perfection. The Peerless, the largest of the traction engines, which was computed at ten-horse power, was a fine specimen of workmanship. Then there was the Nicholas & Sheppard, Battle Creek, of Michigan, eight-horse, being easily controlled by one man, was in operation on the ground. There were other traction engines on the ground, but not in practicable operation. Of the the portables there were the Paxton, of the Harrisburg Car Works, the Chandler & Taylor, of Ohio, these being operated on the ground, the latter sawing lumber, the first-named being neatly and practicably constructed, its smooth running with the least noise; the latter being of great strength and durability, and is conceded in every way to be up to what it claims to be. The separators were numerous, but were not tested for want of grain. In harvesters of grain they were quite numerous, and could be hard to distinguish unless seen in practicable operation in the field. In horse-hay rakes there were some marked improvements. The farmer would do well to examine the Bollinger rake, as it has some excellent features about it, particularly the self-discharging. There were many other rakes in competition, of which they were all good, but as they were not in practicable use, a field trial would only determine. The exhibit of cultivators; these were many—the Oline, the Nash, Kumberlin, and the Nellis, the latter being a combined broadcast seeder and cultivator, and it being practicably operated on the ground. Its operation of pulverizing the earth and sowing the seed at the same time was done in an excellent and precise manner. It is certainly a success as a pulverizer and seed sower combined, and is a very useful machine to the farmer.

The Barb wire making machine, being in operation in machinery hall, attracted large crowds during the exhibition. The steam well boring apparatus drew many lookers-on, it, too, being in operation.

Penfield's brick machine making brick was also a feature of the exhibition. The exhibit of hay tedders was not large, being represented by the

Bullard and the Burdick; the latter was exhibited by the inventor, and showed a great improvement over other tedders in shaking and turning hay, but neither were in practicable use during the exhibition.

The plow exhibit was large. A. Speer & Sons made a very fine display, and of the most excellent finish, having the largest number of different kind of plows. The Syracuse Plow Company was largely represented, and made a fine show. S. A. Allen, of Philadelphia, exhibited garden implements and plows; the display was not large, but very creditable. The collections or displays of agricultural implements were all largely represented by Duff, McKean & Co., E. A. Barns & Co., J. W. Scott & Co., Scobie, Harrison & Parker, and John Henkle. These displays were highly creditable to the exhibitors. Much of this machinery was in motion.

Nellis & McIntyre exhibited some very pretty designs of iron fence. This fence is a great improvement over the ordinary iron fence. It is so constructed that any person can put it up, without calling in the aid of a mechanic. When once set, it is very firm. Its construction makes it a decided improvement over other iron fence.

In the way of steam fittings and tools, and boiler castings, Ewing & Mitchell made a very fine display.

Fire-proof safes, being in the center isle of exhibition building, made a very creditable display, especially the Cincinnati Safe Lock Company, they being made strong and durable, and of the most exquisite finish. The other exhibit, I seldom found any one in attendance, and did not have the opportunity of knowing what they claimed.

Henry Mitchell, of Paterson, New Jersey, exhibited his loom in operation during the fair, weaving fancy silk handkerchiefs. Cooper & Conard, of Philadelphia, their silk loom, which was also in operation during the exhibition, weaving fancy silk dress goods.

Prentice & Hackett had on exhibition their fancy terra-cotta ware and Centennial cement for making walks. This display showed much skill in the exhibitor.

Mr. Brown, of Philadelphia, exhibited a very fine display of Japanese goods.

The Buffalo school-desk, exhibited by J. S. Souder, of Harrisburg, had some improvements worth noticing, that would be a benefit to our schools. There were many other very fine exhibits in this department, on exhibition, but, I am sorry to say, I could so seldom find the exhibitors with their exhibits, that I am unable to give them the proper notice they should have, for want of explanation of the articles.

The improvement this year over previous year will show a much greater percentage. A great deal of the improvement is developed from State fairs. The marked advance in improved machinery is great, which, if left to itself for advancement, would not have reached the plane of practicability it has in thirty years. Now the farmer and mechanic attend the fairs, to discover the improvements, which thirty years ago was not the case. But now progress is the road to improvement in almost every circle of business industry. Let the good work go on by the inventor and the manufacturer of all these great improvements.

CONSTITUTION.

THE PENNSYLVANIA STATE AGRICULTURAL SOCIETY was created a "body corporate" by the Legislature, on the 29th day of March, 1851. The act at large can be found in the statutes for 1851, and in previous volumes of the transactions of the Society. The Society sprung from a meeting held at Harrisburg, on the 21st of January, 1851, in which all the counties of the State were represented. On the 22d, the meeting had taken the form of a society, electing its first president and officers. On the 20th of January, 1852, it held its first annual meeting at Harrisburg, where, in the previous September, its first exhibition had been held, with a good degree of encouragement. Exhibitions have since been held at Lancaster, Pittsburgh, Philadelphia, Harrisburg, Wyoming, Norristown, Williamsport, Easton, Scranton, and Erie, with varying success, but always doing something toward developing the agricultural resources of the State.

The concerns of the Society are intrusted to an Executive Committee, consisting of a President, twenty-seven Vice Presidents, one from each of the congressional districts into which the State is divided, five additional members, all the ex-Presidents, a Corresponding and Recording Secretary, a Treasurer, a Chemist and Geologist, and a Librarian, in all, as at present constituted, a committee of forty-seven.

The constitution has been frequently, but not substantially, amended since its original adoption, in 1852, and now stands as it is given herewith. A list of life members is embodied in this issue. It has been impossible to preserve a necrological register, and, therefore, lapses by death are not noted. The list comprises the names of life members previous to the 1st January, 1882; a total of eight hundred and ten names, representing all parts of the State.

CONSTITUTION OF THE PENNSYLVANIA STATE AGRICULTURAL SOCIETY.

The name of the Society shall be the PENNSYLVANIA STATE AGRICULTURAL SOCIETY. The objects of this Society are to foster and improve agriculture, horticulture, and the domestic and household arts.

Who are Members.

SECTION 1. The Society shall consist of all such persons as shall pay to the Treasurer not less than two dollars, and annually, thereafter, not less than two dollars; and also, of honorary and corresponding members, the names of the members to be recorded by the Secretary.

The officers of county agricultural societies in this State, or delegations therefrom, shall be members *ex officio* of this Society.

The payment of twenty dollars shall constitute life membership, and exempt the members so contributing from all annual payments.

Officers.

SECTION 2. The officers of this Society shall be a President, Vice President from each congressional district, three fourths of whom shall be practical agriculturists or horticulturists, a Treasurer, a Corresponding Secretary, a Recording Secretary, a Librarian, an Agricultural Chemist and Geolgist, and such assistants as the Society may find essential to the transaction of its business; an Executive Committee, consisting of the above-named officers, five additional members, with the ex-Presidents of the Society.

Of the President.

SECTION 3. The President shall have a general superintendence of all the affairs of the Society. In case of the death, illness, or inability of the President to perform the duties of his office, the Executive Committee shall select a Vice President to act in his stead, who shall have the same power and perform the same duties as the President, until the next annual meeting.

Ex-Presidents.

That whenever the number of ex-Presidents exceeds five (5), the name receiving the lowest number of votes shall be the one dropped from the list of officers.

Of the Vice Presidents.

It shall be the duty of the Vice Presidents to take charge of the affairs of the association in their several districts; to advance all its objects; to call upon farmers to report as to the condition of agriculture in their neighborhood; to ask for information as to the modes of cultivation adopted by different farmers; and, as far as in their power, to make known the resources of their districts, the nature of its soil, its geological character, and all such matter as may interest farmers in every part of the State.

Treasurer.

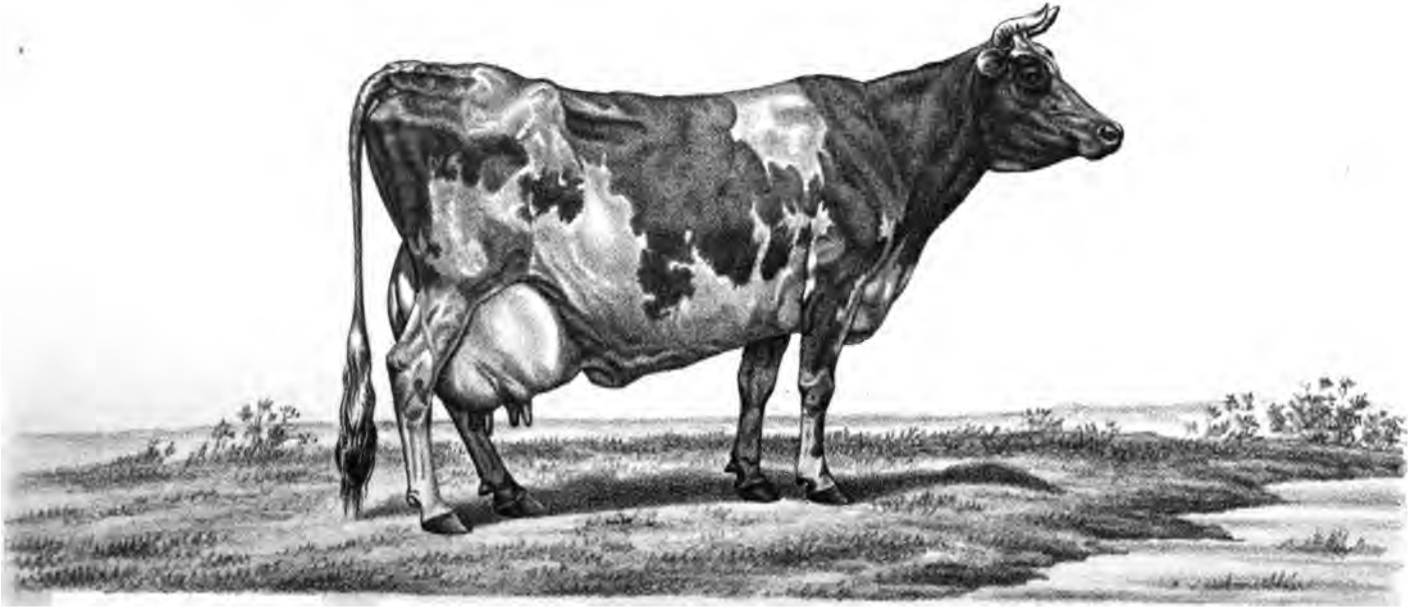
The Treasurer shall keep an account of all moneys paid into his hand, and shall pay bills when audited and approved by the Executive Committee. Each order for payment must be signed by the President or chairman of the Executive Committee.

Corresponding Secretary.

The duty of this officer shall be to invite a correspondence with all persons interested in agriculture, whether in the State of Pennsylvania or elsewhere, but especially with our consuls in foreign countries, that new seeds, vegetables, or live stock may be introduced, and their fitness for cultivation and propagation in our climate be tested. At each stated meeting of the Society, he shall read his correspondence, which shall, either the whole, or such parts as may be selected by the Society, form a portion of the transactions. He shall also correspond with the President or other officers of each State society in the United States, at least twice in the year, for purposes of combined and mutual action, and to be informed of the results and progress of each other's efforts; also, to invite mechanics to forward models or implements for examination and trial.

Recording Secretary.

The Recording Secretary shall keep the minutes of the Society and of the Executive Committee. At the close of each year he shall prepare for publication such parts of the minutes and transactions of the Society as may be designated.



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Librarian.

The Librarian shall take charge of all books, pamphlets, &c., belonging to the Society, and shall act as curator to preserve seeds, implements, or whatever property the Society may possess.

Executive Committee and Quorum.

The Executive Committee shall transact the business of the Society generally; shall superintend and direct the publication of such of the reports and transactions as they may deem proper, and shall designate the time and places for annual exhibitions, regulate the expenditures, examine all accounts, and keep such general charge of the affairs of the Society as may best promote its interests.

They shall select their own chairman, and meet quarterly, and at any other time when convened by the President; five members shall form a quorum.

They shall call special meetings of the Society when necessary.

Annual Meeting of the Society and Quorum.

Section 4. The Society shall meet annually, on the third Wednesday of January, at Harrisburg, when all the officers of the Society, not otherwise appointed, shall be elected by ballot for the ensuing year, and until another election. They shall also hold a general meeting at the time of the annual exhibitions, and special meetings whenever convoked by the Executive Committee.

Fifteen members shall form a quorum for the transaction of business, but no member in arrears shall be entitled to the privileges of the Society.

Qualifications of Voters.

Section 5. No annual member, heaeafter, shall be entitled to vote for the election of officers of the Pennsylvania State Agricultural Society, unless he shall have been a member at the previous State fair, and in default of a State fair, then three months' previous membership shall be necessary.

Section 6. No one shall be eligible to office hereafter who has not obtained a right to vote under section five.

Alterations.

Section 7. This constitution may be altered or amended at the annual meetings in January, by a vote of two thirds of the members in attendance.

All amendments to the constitution, to be voted upon at the annual meeting of the Society in January, must be submitted to the meeting of the Executive Committee, in September preceding said annual meeting.

LIFE MEMBERS.

Anspach, J., Jr., Philadelphia.
Armstrong, James, Williamsport.
Allen, Robert P., do.
Andrus, D. S., do.
Allen, Charles, do.
Armstrong, William H., do.
Allen, John H., Montourstown.
Ayres, J. J., Williamsport.
Andrews, E., Williamsport.
Allen, William H., Agricultural College.
Armstrong, W. H., Easton.
Ashbridge, E. B., Willistown Inn P. O.
Allen, John E., Middletown.
Alricks, William K., Harrisburg.
Allen, John F., Harrisburg.
Anderson, James, Hogestown,
Archer, W. L., Burgettstown.
Adney, W. H. G., Washington.
Bucher, G. H., Hogestown, Cumb. co.
Biddle, Craig, Philadelphia.
Boal, George, Boalsburg.
Bryson, Robert, Carlisle.
Brock, William Penn, Philadelphia.
Brown, George H., do.
Bolden, George, do.
Bard, Edwin Milford, do.
Burnside, James, Bellefonte.
Benson, G. S., Philadelphia.
Bradford, Vincent L., Philadelphia.
Billings, James B., Philadelphia.
Baker, Elias, Altoona.
Brautigam, Daniel, Northumberland.
Brown, Jacob B., Columbia.
Bell, Samuel, Reading.
Bell, William, Mifflin.
Bennett, James, Pittsburg.
Beck, John B., Williamsport.
Bowman, Samuel, Wilkes-Barre.
Breeze, N. W., Wyoming.
Barto, Tobias, Reading.
Bercaw, Abraham, Easton.
Berkenbine, Samuel, Northumberland.
Blair, Horace H., Williamsport.
Beard, Henry, do.
Beck, Samuel M., do.
Brown, James V., do.
Brown, Jacob, Newberry.
Berry, John J., Williamsport.
Bush, D. G., Bellefonte.
Butt, Charles H., Williamsport.
Bender, George H., Easton.
Blight, George, Germantown.
Boyd, T. S., Easton.
Brawdy, George, Sharpsburg.
Bergner, George, Harrisburg.
Bissell, William S., Pittsburg.
Bittenbender, Stephen, Shamokin.
Brown, G. W., M. D., Port Carbon.
Boyd, S. T., Easton.
Boas, C. A., Harrisburg.
Bates, Abram, Harrisburg.
Bigler, Samuel S., Harrisburg.
Bomberger, Jacob C., do.
Boyer, W. W., do.
Briggs, John H., do.
Boas, D. D., do.
Bird, Joseph, Northumberland.
Buehler, Charles, Harrisburg.
Barr, W., Dr., Harrisburg.
Bailey, Charles L., Pottstown.
Brown, James C., New Greenville.
Bound, David T., Kingston.
Branson, D. H., Coatesville.
Baldwin, W. A., Williamsport.
Brown, ——, Titusville.
Baker, J. B., Thorndale, Chester co.
Baker, J. B., Jr., Thorndale, Chester co.
Boyd, J. F., Chambersburg.
Bergner, C. H., Harrisburg.
Barbour, J. B., Pittsburg.
Beaver, James A., Bellefonte.
Boyer, George W., West Fairview.
Bush, L. L., Newtown.
Banker, D. and J., Franklin Forks, Susquehanna co.
Cameron, Simon, Middletown.
Curwen, John, Harrisburg.
Chambers, Andrew R., Philadelphia.
Christian, S. J., do.
Campbell, Hugh, do.
Campbell, James R., do.
Colkit, C., do.
Craig, Hugh, do.
Carpenter, George W., Jr., Germantown.
Campbell, Thompson, San Francisco, Cal.
Cassidy, Joseph A., Philadelphia.
Clark, Edward S., Philadelphia.
Carmalt, S., Friendsville, Susquehanna co.
Carlisle, Robert M., Philadelphia.
Campbell, William S., Philadelphia.
Cowden, J. B., Northumberland.
Chess, Moses, Temperanceville.
Corson, George N., Norristown.
Cake, Joseph W., Northumberland.
Calder, James, Rev., Harrisburg.
Clymer, Hiester, Reading.
Conner, Joseph P., Fowlersburg.
Crans, Samuel M., Williamsport.
Campbell, John R., do.
Clark, James, do.
Clay, M. L., do.
Coleman, Fletcher, do.
Canfield, Ezra, do.
Campbell, E. B., Jersey Shore.
Cummings, R. D., Bellefonte.
Clayton, William, Pine Grove.
Cramer, Jacob, Uniontown.
Carter, William N., Jersey Shore.
Coryell, John B., Williamsport.
Crawford, A. S., do.
Colton, Henry, do.
Coder, N. B., do.

Capron, E. W., Williamsport.
Calvin, Otts P., N. Y. City, 234 Broadway.
Carpenter, E. P., Pittsburg.
Charles, J. S., do.
Cluly, William, do.
Coburn, J. P., Aaronsburg, Centre co.
Crawford, M. H., Philadelphia.
Child, S. S., Harrisburg.
Cummings, Charles, Harrisburg.
Colestock, Jacob M., do.
Colestock, Samuel J., do.
Cassell, Jacob, do.
Crisswell, J. Vance, do.
Coover, John B., Mechanicsburg.
Cameron, J. D., Harrisburg.
Chrisman, R. R., Harrisburg.
Callahan, George, Philadelphia.
Connelly, John, Hyde Park.
Cassatt, A. J., Philadelphia.
Crawford, Albert, Philadelphia.
Clark, James, Harrisburg.
Culver, W. B., Scranton.
Clopper, Greensburg, Westmoreland co.
Darlington, J. Lacy, West Chester.
Davis, Atlee G., Philadelphia.
Dettry, Henry F., Philadelphia.
Dickey, E. V., Oxford.
Durar, Enoch, Philadelphia.
Dallett, John, do.
Devereux, John, do.
Devereux, James, do.
Deal, Daniel, do.
Dasher, David, Harrisburg.
Drinker, H., Montrose.
Driesbach, Daniel G., Beach Haven.
Davis, William L., Easton.
Dœbler, V. S., Williamsport.
Dunlap, H. E., Newberry.
Davis, John L., Newberry.
DuBois, John, Williamsport.
Datesman, Robert, Milton.
DeHaven, Jehu, Harrisburg.
Dempster, Robert, Phillipsburg, N. J.
Duncan, J. L., M. D., Pittsburg.
Demees, John, Shamokin.
Darlington, H., Pittsburg.
Davis, Joseph H., Pittsburg.
Dull, J. J., Harrisburg.
Dougherty, James D., Harrisburg.
Dougherty, Daniel, Harrisburg.
Deitz, George A., Chambersburg.
DuBarry, J. N., Harrisburg.
Dillingham, J. B., West Chester.
Davis, E. W., Philadelphia.
Diehl, J. E., Beverly, N. J.
Dykeman, G. R., Shippensburg.
Dickey, Samuel, Oxford, Chester co.
Eli, Richard E., Philadelphia.
Evans, David, Philadelphia.
Edwards, William A., Philadelphia.
Ellis, William, Philadelphia.
Evans, John, York.
Elwyn, A. L., Philadelphia.
Eby, Jacob R., Harrisburg.
Eichbaum, William, Pittsburg.
Eberly, Christian, Cumberland.
Everhart, J. T., Pittston.
Engle, Charles K., Bustleton.
Ellis, B. Morris, Hughesville.
Early, Martin, Palmyra.
Eddy, George W., Philadelphia.
Ensworth, L. A. Williamsport.
Eves, George S., Williamsport.
Embick, Frederick E., Williamsport.
Eldred, Charles D., do.
Elder, Mathias, do.
Edwards, Charles, do.
Elliott, William G., do.
Eveland, S. D., do.
Evender, Thomas, do.
Epes, William J., do.
Elser, D. B., do.
Eckert, Isaac, Reading.
Evans, Robert, Erie.
Ever, Andrew, Muncy.
Elder, James, (Swatara,) Harrisburg.
Elliott, B. A., Pittsburg.
Elliott, W. R., do.
Estep, J. P., do.
Etter, B. F., Harrisburg.
Emminger, John, Hogestown.
Early, D. S., Hummelstown.
Egle, W. H., M. D., Harrisburg.
Ensminger, J. T., do.
Emminger, W. H., do.
Edwards, Oliver, do.
Englebert, A. F. Wiconisco.
Fager, George C., Harrisburg.
Fertig, John, Titusville.
Freas, P. R., Germantown.
Frantz, Jacob, Mount Hope, Lancaster co.
Fotterall, Stephen G., Philadelphia.
Foster, Frank T., do.
Failes, George, do.
Flenniken, J. C., Waynesburg, Greene co.
Felton, S. M., Philadelphia.
Fulton, Andrew, Pittsburg.
Fleming, Robert, Williamsport.
Fessler, Philip, do.
Foresman, Robert M., do.
Fisher, John S., do.
Foresman, D. W., do.
Foresman, John, do.
Foresman, Daniel F., Slifer, Union co.
Foresman, R. S., Williamsport.
Fuller, J. W., Montoursville.
Farrell, John, Pittsburg.
Fass, G., Allegheny City.
Frisch, B., Harrisburg.
Fisler, J. E , do.
Fisler, Amos, do.
Fleming, Dr. James, Harrisburg.
Flickinger, Samuel, do.
Fisher, John R., do.
Fox, Richard, Hummelstown.
Feeman, Valentine, Harrisburg.
Fellowes, J. Turbey, Scranton.
Fiske, A. R., Harrisburg.
Farnum, J. E., Philadelphia.
Filler, John H., Harrisburg.
Grout, H. T., Philadelphia.
Grigg, John Warner, Philadelphia.
Glass, Alexander F., Philadelphia.
Garber, Jacob B., Columbia.
Gillespie, James, Philadelphia.
Gould, J. E., Philadelphia.
Gross, Daniel W., Harrisburg.
Gilbert, Henry, Harrisburg.
Gardner, Jacob, Pittsburg.
Goe, John S., Brownsville.
Goe, John S., Jr., Brownsville.
Gould, Stephen, Williamsport.
Gould, John, Luzerne co.
Gehr, D. O., Chambersburg.
Garis, David, Easton.
Gilmore, Joseph, Williamsport.

Grier, James, Newberry.
Gibson, C. E., Williamsport.
Gould, Robert S., do.
Gibson, John, do.
Garman, Samuel, do.
Gould, Alexander S., Hickory Run, Lycoming co.
Gregg, Theodore, Bellefonte.
Guernsey, H. A., Philadelphia.
Gaynor, Edward J., Easton.
Greenawalt, Alexander, Allegheny City.
Glenn, John McDonald, Pittsburg.
Glenn, Robert W., Noblestown.
Grove, M. M., Harrisburg.
Gohl, A., Harrisburg.
Garman, John Hyde Park.
Griffin, Henry, Scranton.
Germyn, John, Rushdale.
Gibbs, J. W., M. D., Hyde Park.
Gregory, J. W., Scranton.
Griest, Chas. W., York Sulphur Springs.
Gowen, F. B., Philadelphia.
Glatz, A. Hiestand, York.
Haldeman, Jacob S., New Market.
Heister, A. O., Harrisburg.
Hutchinson, S. Pemberton, Philadelphia.
Hickock, W. O., Harrisburg.
Hacker, William, Philadelphia.
Harvey, Chalkey, Chadd's Ford.
Hazeltine, John, Philadelphia.
Hoopes, Thomas P., Philadelphia.
Hamilton, A. Boyd, Harrisburg.
Hoffman, H. W., do.
Haldeman, Jacob M., do.
Haddock, D., Jr., Philadelphia.
Hall, George E., Philadelphia.
Heister, F. A. M., Reading.
Haehnlen, Frederick P., Harrisburg.
Hoffer, John, Harrisburg.
Hamilton, Hays, Huntingdon Furnace.
Hicks, James, Pittston.
Hutchins, Thomas, Wyoming.
Harvey, E. B., Wilkes-Barre.
Hollenback, George M., Wilkes-Barre.
Hitner, Henry S., Barren Hill.
Holstein, William H., Bridgeport.
Hartranft, Samuel E., Norristown.
Haehnlen, Jacob, Harrisburg.
Hackett, J. M., Easton.
Hetrick, Josiah P., do.
Hutter, William H., do.
Hartman, John, Williamsport.
Hartman, Mathias, Catawissa.
Hagerman, Augustus H., Williamsport.
Herdic, Peter, do.
Hill, Theodore, do.
Hall, John B., do.
Hudson, Joseph E., do.
Heidler, David, do.
Holden, H. L., do.
Hays, J. W., do.
Huling, Louis G., do.
Hinkle, John R., Newberry.
Higgins, William C., Williamsport.
Huyck, George, Newberry.
Hull, Joseph F., Hull's Mill.
Hepburn, Andrew, Williamsport.
Harrington, Thomas L., Williamsport.
Heylmun, E. G., Crescent, Lycoming co.
Howell, A., Williamsport.
Howland, Rausford, Williamsport.
Hastings, H. S., Williamsport.
Holliday, B. B., Wellboro'.
Hepburn, John, Williamport.
Hagy, Philip, Williamsport.
Hull, W. R., Cogan Station.
Hise, Adam, Williamsport.
Harriottt, W. A., Oakdale, Allegheny co.
Hamilton, Cyrus E., Williamsport.
Hoffman, Philip, Williamsport.
Hester, Joseph M., Easton.
Hetick, Reuben, Easton.
Higgins, William V., Williamsport.
Hemingway, E. E., Easton.
Hugus, P., Pittsburg.
Hale, James P., Osceola, Clearfield co.
Higgins, William V., Williamsport.
Herr, Henry, Harrisburg.
Hummel, Richard H., do.
Hummel, William, do.
Hickman, Amos S., Monticello, Illinois.
Hynicka, George, Harrisburg.
Hummel, S A., do.
Haehnlen, William, do.
Hamilton, Hugh, do.
Hargest, William F., do.
Hostio, John, do.
Herr, D. S., do.
Hummel, Alfred, do.
Hall, John W., do.
Heck, Lewis, M. D., Dauphin.
Hamilton, T. A., Harrisburg.
Hain, George, Lower Paxton, Dauphin co.
Hoffman, H. B., Millersburg.
Hunter, George W., Harrisburg.
Hutchinson, J. W., do.
Hildrup, W. T., do.
Halstead, N., Scranton.
Hill, J. F., do.
Halstead, W. F., do.
Hinckley, Isaac, Philadelphia
Herman, John C., Harrisburg.
Ingersoll, Harry, Philadelphia.
Irwin, James, Philadelphia.
Innis, John A., Easton.
Jordan, John, Philadelphia.
Jefford, A. H., Wyoming.
Jenkins, G. S., do.
Jenkins, Steuben, do.
Jones, Daniel, Exeter, Luzerne co.
Jessup, William H., Wilkes-Barre.
Jackson, George D., Dushore, Sullivan co.
Johnston, William, Easton.
Jones, John E., Williamsport.
Jarrett, John, Hepburn, Lycoming co.
Jones, Samuel, Williamsport.
Jamison, Edward, Newberry.
Jamison, L., Williamsport.
Jeter, Tinsley, Bethlehem.
Jones, B. F., Pittsburg.
Jordan, Thomas J., Harrisburg.
Jones, W. H., Philadelphia.
Kennedy, A. L., M. D., Philadelphia.
Kapp, Amos E., Northumberland.
Kramer, Philip, Philadelphia.
Knight, William K., do.
Kimbal, Stephen, do.
Knight, Edward C., do.
Keller, John S., Orwigsburg.
Kunkle, Benjamin S., Harrisburg.
Knapp, D. B., Williamsport.
King, C. M., White Deer Mills, Centre co.
Kinyon, S. C., Williamsport.
Kunsman, William H., Easton.
King, Alexander, Pittsburg.
Kreybill, Jacob E., Marietta.

Knipe, Joseph F., Harrisburg.
Koller, Henry M., do.
Kuhn, William, do.
Keely, Jerome, Union Deposit, Dauphin co.
Kirby, William C., Harrisburg.
Kepple, John, Harrisburg.
Kirkpatrick, John D., North Liberty, Mercer co.
Kelker, Immanuel, Harrisburg.
Keim, George de B., Philadelphia.
Kinny, L., Philadelphia.
Kennedy, Thomas B., Chambersburg.
Kemball, J. M., Erie.
Lukenbaugh, Charles Augustus, Bethlehem.
Longstreth, John, Bristol.
Lauman, George M., Harrisburg.
Lauguerrene, P. L., Philadelphia.
Linn, Philip, Harrisburg.
Lafrance, Isaac T., Wyoming.
Lee, Washington, Jr., Wilkes-Barre.
Leacock, J. R., Wyoming.
Longaker, A. Brower, Norristown.
Line, J. M., Allentown.
Lawell, Edward, Easton.
Lerch, Frederick, Easton.
Logan, Millard F., Williamsport.
Lowe, Elias S., do.
Love, Samuel, do.
Lyon, Thomas, do.
Lippencott, Edward, do.
Lentz, George W., do.
Lehman, M., do.
Levan, E., M. D., do.
Long, Henry B., Pittsburg.
Long, W. J., Osceola, Clearfield co.
Lamberton, Robert A., Harrisburg.
Lauer, Frederick W., Reading.
Lemon, John A., Hollidaysburg.
Lafferty, Charles, Philadelphia.
Marvin, Selden, Erie.
Marshall, William, Bellefonte.
Meredith, James M., West Chester.
McKinley, Isaac G., Harrisburg.
Miles, James, Girard, Erie co.
McIlvane, Abram R., Brandywine Manor, Chester co.
Murdock, John, Jr., Pittsburg.
Mellor, Thomas, Philadelphia.
Mellon, Thomas, do.
Magee, James, do.
McCully, Francis G., do.
McKean, H. P., do.
McKean, Samuel M., Williamsport.
Martin, George H., Philadelphia.
McCrea, William H., Philadelphia.
McIntyre, Peter, York.
McFarland, John, Ligonier.
Middleton, E. P., Philadelphia.
Magee, George, Philadelphia.
Muhlenberg, H. H., Reading.
McDowell, John, Washington.
Murray, William F., Harrisburg.
McAllister, Archibald, Springfield Furnace, Blair co.
Metzger, William, Harrisburg.
Murdock, A. C., Pittsburg.
Merrick, George, Northumberland.
McAllister, John C., Fort Hunter, Dauphin co.
Maxwell, Henry D., Easton.
Myers, Henry, Forty Fort.
Marcy, Ira, Wilkes-Barre.
Martin, Dewees J., Allentown.
Mutchler, John, Easton.
McMinn, J. M., Williamsport.
Mudge, Hiram, do.
Monday, S. S., do.
McLowell, Lewis, do.
McCormick, Robert, Montoursville.
Moore, Wesley, Newberry.
Mahaffey, David, Cogan Station.
Mahaffey, Lindsey, Newberry.
McMicken, J. B.. Williamsport.
Miller, Larr, Wayne, Clinton co.
Mahaffey, William J., Newberry.
Maxwell, Jacob S., Williamsport.
Miles, James, Milesgrove.
Morse, H. S., Williamsport.
Montgomery, J. B., do.
Munday, H. F., do.
Morrison, S. G., do.
Morris, John C., Friendsville.
McCauley, George W., Harrisburg.
Messinger, Samuel, Easton.
McCain, Daniel, Allegheny City.
McKelvy, James, Wilkinsburg, Allegheny co.
Morris, D. B., Pittsburg.
McPherson, J. S., Wilkins.
McNish, A. L., Pittsburg.
Marchard, John, Pittsburg.
Magan, David, New Brighton, Beaver co.
McFarland, John, Northumberland.
Montgomery, Joseph, Harrisburg.
Motter, John, do.
Mark, George M., do.
Middleton, Richard, do.
Miller, Willam H., do.
Mumma, David, do.
McFarland, George F., do.
McConkey, Elbridge, do.
McDonald, Lewis, do.
McCormick, David, do.
Miller, J. G., do.
McCormick, James, do.
Morse, L. W., Ledgedale, Wayne co.
Moore, E. B., West Chester.
McKean, H., Pittsburg.
Miller, John M., Hickory, Washington co.
McPherson, Edward, Gettysburg.
Monaghan, R. E., West Chester.
Myers, B. F., Harrisburg.
McClure, A. K., Philadelphia.
McDowell, John, Washington.
McCaughey, J. A., Downingtown.
Mackey, L. A., Lock Haven.
Miller, J. M., Hickory.
Neilson, Robert, Philadelphia.
Neff, Robert K., Philadelphia.
Newton, G. B., Springfield, Delaware co.
Noble, John, Carlisle.
Noble, F. W., Easton.
Nissley, John J., Hummelstown.
Nicely, George W., Newberry.
Nutting, Lyman, Pine Grove, Schuylkill co.
Nichols, Joseph, Williamsport.
Nichols, W. F., Williamsport.
Neilman, D. H., Easton.
Nissley, Joseph, Harrisburg.
Opp, George S., Maryland, Lycoming co.
Osthout, Jacob H., Harrisburg.
Odenwelder, Henry L., Easton.
Olewine, Benjamin, Harrisburg.
Ott, Leander N., Dauphin co.

Packer, William F., Williamsport.
Pritchett, Borradale, Frazier, Chester co.
Perrott, W. S., Philadelphia.
Pennock, Samuel, Kennett Square, Chester county.
Pratt, Thomas, Philadelphia.
Pomroy, John L., Philadelphia.
Peyson, Auguste, Philadelphia.
Presbury, George G., Jr., Philadelphia.
Priestly, J. R., Northumberland.
Parsons, H. K., Harrisburg.
Peters, Benjamin G., Harrisburg.
Pennock, Joseph, Harrisburg.
Patterson, Robert H., Pittsburg.
Powell, Robert H., Philadelphia.
Paxton, Joseph, Catawissa.
Polen, Albert, Wyoming.
Peters, C. P., Concordsville.
Potts, E. Channing, Norristown.
Parsons, Leroy, Harrisburg.
Pyle, R. C., Easton.
Purcell, Sylvester, Bloomsburg.
Parsons, Henry C., Williamsport.
Piatt, John, Williamsport.
Pollock, Samuel, Williamsport.
Porter, John F., Newberry.
Parker, Samuel J., Williamsport.
Perkins, H. J., Williamsport.
Perkins, James H., Lemar.
Page, A., Williamsport.
Post, G. S., Williamsport.
Parke, John E., Pittsburg.
Patterson, Lebanon Church, Allegheny co.
Phelps, W. H., Pittsburg.
Pemberton, Clifford, Pittsburg.
Phillips, John, Pittsburg.
Power, John, Harrisburg.
Parsons, George W., Harrisburg.
Postlethwaite, E. T., Philadelphia.
Patterson, John, Glenmore, Chester co.
Paxson, J. A., Philadelphia.
Rogers, C. B., Philadelphia.
Roberts, Algernon S., Philadelphia.
Rutherford, John P., Harrisburg.
Rice, William, Philadelphia.
Roberts, Isaac, Norristown.
Rudman, William C., Philadelphia.
Robeson, H. P., Robesonia, Berks county.
Rodgers, Fairman, Philadelphia.
Rhodes, William A., Philadelphia.
Ronaldson, Richard, Philadelphia.
Reif, C. P., Philadelphia.
Rutherford, S. S., Harrisburg.
Rutherford, Abner, Harrisburg.
Reily, John A., Harrisburg.
Rodd, Jacob, Pittsburg.
Robinson, ——, Philadelphia.
Rutter, Nathaniel, Wilkes-Barre.
Ross, William S., Wilkes-Barre.
Rutherford, John B., Harrisburg.
Ruggles, A. C., Williamsport.
Rutherford, W. F., Paxton.
Reighard, James B., Newberry.
Reighard, Daniel, Newberry.
Renninger, W. H., Williamsport.
Rook, D. N., Williamsport.
Rank, L. D., Williamsport.
Rouse, William A., Harrisburg.
Reed, Alexander, Lock Haven.
Rodenbough, Joseph S., Easton.
Reeder, Mrs. A. H., Easton.
Richards, Henry, Easton.
Reigel, Joseph, Easton.
Roth, Jeremiah, Allentown.
Rogers, Felix, Pittsburg.
Rowley, Thomas A., Pittsburg.
Russell, Alexander H., Harrisburg.
Rogers, Lucius, Smethport, McKean co.
Raymond, James, Harrisburg.
Reel, Augustus, Harrisburg.
Rutherford, William S., Harrisburg.
Reel, John, Harrisburg.
Reed, James, Middle Paxton, Dauphin county.
Reichenbach, E. C., Harrisburg.
Rudy, Joseph, Harrisburg.
Rutherford, F. W., Paxton.
Rupp, Henry S., Shiremanstown, Cumberland county.
Rutherford, J. E., Harrisburg.
Rhey, George, Milwood, Westmoreland county.
Richmond, William H., Carbondale.
Rand, George W., Scranton.
Reed, E. W., Erie.
Rutherford, Silas, Paxton.
Rutherford, J. Q. A., Paxton.
Rutherford, S. Parke, Cochranville, Chester county.
Savery, Peleg B., Philadelphia.
Stambaugh, S. C., Lancaster.
Sergeant, William, Philadelphia.
Strouble, Jacob, Zion, Centre county.
Snow, Edward K., Philadelphia.
Sharp, Joseph W., Philadelphia.
Smith, Daniel, Jr., Philadelphia.
Smith, Thomas, Philadelphia.
Scull, Gideon, Philadelphia.
Silverthorn, M. H., Fairview, Erie county.
Starr, Isaac, Philadelphia.
Shoemaker, B. A., Philadelphia.
Schaffer, W. L., Philadelphia.
Smith, George, Upper Darby, Delaware county.
Speer, William W., Pittsburg.
Spencer, S. S., Lancaster.
Swift, Joseph, Philadelphia.
Slade, Alfred, Philadelphia.
Stuart, George H., Philadelphia.
Small, Samuel, York.
Sharwood, Denny, Philadelphia.
Speer, Alexander, Pittsburg.
Stokes, William A., Greensburg.
Sturdevant, E. W., Wilkes-Barre.
Sheets, J. H. Von, Orwigsburg.
Shoemaker, William M., Wyoming.
Sturdevant, E. J., Wyoming.
Speece, L. B., Wyoming.
Smith, J. B., Dunmore.
Shoemaker, William S., Wyoming.
Schooley, J. B., Wyoming.
Smith, J. B., Plymouth.
Shoemaker, Elijah, Kingston.
Sharp, John, Jr., Wyoming.
Stark, J. B., Wilkes-Barre.
Stephens, Z., Scranton.
Sower, F. D., Norristown.
Schall, David, Norristown.
Schreiber, O. L., Laubach, Northampton county.
Sigman, Joseph, Easton.
Snyder, Daniel W., Easton.
Schreiner, J. W., Lewisburg.
Singer Manufacturing Company, Philadelphia.
Swan, Rufus C., Williamsport.

Sheffler, A. G., Williamsport.
Smith, Henry B., Williamsport.
Smith, Joseph W., Newberry.
Stearns, L. L., Williamsport.
Stewart, Robert, Lemar.
Showers, Jesse, Rauch Gap.
Smith, Thomas, Williamsport.
Showers, D. H., Williamsport.
Smith, Daniel W., Williamsport.
Saxton, J. O., New Kingston.
Shaw, Hugh, Jersey Shore.
Smith, J. D. L., Mill Hall.
Seltzer, George L., Myerstown.
Seitz, George, Easton.
Seitz, Frederick, Easton.
Serch, David, Easton.
Scott, John, Pittsburg.
Sharpless, S. J., Street Road, Chester co.
Smith, George, New York city.
Seiler, Daniel W., Harrisburg.
Shoemaker, John, do.
Scheffer, Theodore, do.
Smith, Jacob, do.
Shaffer, William S., do.
Simon, John B., do.
Smull, John A., do.
Shellenberger, Henry, do.
Scott, George, Catawissa.
Sharp, Samuel W., Newville.
Sheck, J. H., Harrisburg.
Silkman, William M., Scranton.
Smith, H. K., Philadelphia.
Sharpless, Charles L., Philadelphia.
Singerly, W. M., Philadelphia.
Smith, George Handy, Philadelphia.
Steel, John M., Greensburg.
Steel, William, Greensburg.
Smith, Philip L., Philadelphia.
Shaner, Jefferson, West Chester.
Thompson, John I., Half Moon, Centre co.
Thomas, George, Belvidere, Chester co.
Thatcher, Richard, Marsh, Chester co.
Thompson, N. B., Philadelphia.
Tatham, H. B., Philadelphia.
Tatham, George N., Philadelphia.
Towers, William H., Philadelphia.
Taggart, David, Northumberland.
Taggart, John, Northumberland.
Tasker, Thomas T., Philadelphia.
Tripp, Ira, Scranton.
Trout, Michael C., Sharon, Mercer co.
Tyson, Carrol S., Norristown.
Thomas, Henry, Harrisburg.
Templin, James R., Easton.
Taylor, Benjamin H., Williamsport.
Taylor, Horace E., Williamsport.
Thompson, James, Cogan Station.
Trump, Edward D., Jersey Shore.
Tinsman, Garrett, Williamsport.
Tinseley, Peter, Bethlehem.
Thayer, Russel A., Allentown.
Templin, William, Harrisburg.
Taylor, William, Wormelsdorf, Berks co.
Taylor, B. Frank, do. do.
Taylor, George R., do. do.
Thomson, Frank, Philadelphia.
Twaddell, L. H., Philadelphia.
Urquehart, John, Wilkes-Barre.
Updegraff, A., do.
Updegraff, Thomas, Newberry.
Updegraff, Daniel, Newberry.
Updegraff, Derrick, Newberry.
Unger, David J., Harrisburg.
Unger, John G., Harrisburg.
Van Leer, Isaac W., Wallace, Chester co.
Vouges, James C., Philadelphia.
Vanvoorhis, H. B., Pittsburg.
Vanscoy, Daniel, Wyoming.
Van Voroe, John, Williamsport.
Van Buskirk, S., do.
Vandyke, James, Northumberland.
Walker, George, Montrose.
Watts, Frederick, Carlisle.
Walker, R. C., Elizabeth, Allegheny co.
Wood, Robert, Philadelphia.
Waterman, Joseph, Philadelphia.
Watson, Johanna, Philadelphia.
Welsh, John, Philadelphia.
Welsh, Samuel, Philadelphia.
Weaver, H. A., Pittsburg.
Wright, Joshua, Washington county.
Watson, A. W., Harrisburg.
Walters, S. H., Northumberland.
Wright, Joshua, Findleyville, Washington county.
Waterman, Albert G., Philadelphia.
Wood, Thomas, Penningtonville.
Woodhams, Samuel, Plymouth.
Williams, Stiles, Wilkes-Barre.
Wright, H. B., do.
Waters, Townsend, West Chester.
Wetherill, William, Norristown.
Wentz, Thomas H., Norristown.
Whitman, Joseph, Centre Valley P. O.
Williams, E. C., Harrisburg.
Woodward, John V., Williamsport.
Watson, Oliver, do.
White, Henry, do.
Wolf, Peter, do.
Wingard, Samuel C., do.
Watson, Henry W., do.
Weaver M. B., do.
White, John, do.
Wait, B., do.
Wood, James M., do.
Wescott, Thos. S., Ashland, Schuylkill co.
Ward, C. L., Towanda.
Workheiser, Enos, Easton.
Wallace, W. W., Pittsburgh.
Withington, W. P., Shamokin.
Why, John, Jr., Pittsburg.
White, J. A. G., Osceola, Clearfield co.
Wallower, John, Harrisburg.
Winters, George, Harrisburg.
Wolfinger, Levi, Harrisburg.
Wible, William, Gettysburg.
Watts, William M., Mechanicsburg.
Warford, A. B., Harrisburg.
Wolf, William, Harrisburg.
Wilhelm, A., Cornwall.
Walker, John H., Erie.
Waggoner, John A., Harrisburg.
Wilson, D. Y. Gum Tree, Chester county.
Walter, D. J., Bloomsburg.
Yeager, Joseph, Philadelphia.
Young, Alexander, Philadelphia.
Yeaton, William H., Philadelphia.
Youngman, George W., Williamsport.
Young, William, Easton.
Young, John, Jr., Ewing's Mills, Allegheny county.
Young, James, Middletown.
Ziegler, John H., Harrisburg.
Zimmerman, F., Williamsport.
Zimmerman, A. M., Harrisburg.
Zerbe, Cyrus, Harrisburg.

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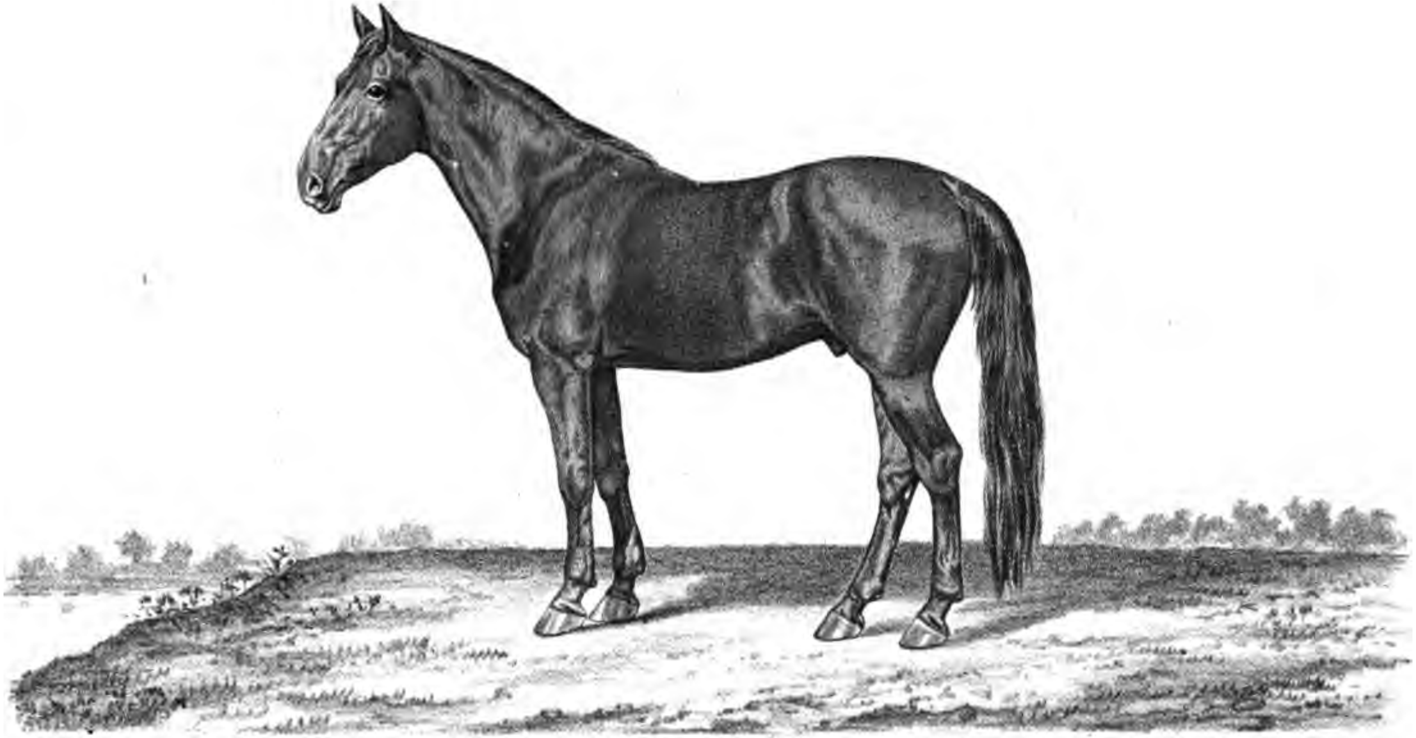

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LEGISLATIVE DOCUMENT, **No. 4.**

REPORT

OF THE

Pennsylvania State Dairymen's Association, 1882.

LIST OF OFFICERS.

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JOHN FULLER, Harmonsburg.

Secretary.
H. COOLEY GREENE, Meshoppen.

Treasurer—J. H. LENHART, Meadville.

Vice Presidents.

A. M. Fuller,	Meadville.
John Cole,	Venango.
H. C. King,	Springboro'.
H. McGuire,	Conneautville.
M. H. Terry,	Waterford.
M. Phelps,	Edinboro'.
A. W. Wellman,	Edinboro'.
A. H. Bates,	Penn Line.
A. B. Griffing,	Linesville.
T. Hollembeak,	Springboro'.
John Hotchkiss,	Guy's Mills.
Hon. S. H. Findley,	Atlantic.
S. G. King,	Mill Village.
S. C. Mead,	Venango.
J. B. Bertolet,	Oley, Berks county.
C. A. Tewksbury,	Auburn Centre, Susquehanna county.
W. H. Young,	New Hanover, Montgomery county.
Col. J. C. Morris,	Friendsville, Susquehanna county.
G. W. Carroll,	Union City, Erie county.
Hon. Eastman Reeder,	Bucks county.

Executive Committee.

JOHN FULLER,
H. C. GREENE,
J. H. LENHART,
A. M. FULLER,
JOHN COLE,
H. C. KING.

CONSTITUTION

OF THE

PENNSYLVANIA STATE DAIRYMEN'S ASSOCIATION,

Adopted April 13, 1871, Amended January 18, 1882.

SECTION 1. This organization shall be known as the Pennsylvania State Dairymen's Association.

SECTION 2. Its purpose shall be to improve and develop the dairy resources of Pennsylvania.

SECTION 3. Its membership shall consist of such persons as shall pay into the treasury the requisite fees, and of honorary members. The fee for permanent membership shall be one dollar, and for annual membership fifty cents.

SECTION 4. Its officers shall consist of a President, Secretary, Treasurer, and twenty Vice Presidents.

SECTION 5. The Executive Committee shall be composed of the president, secretary, treasurer, together with the first three vice presidents, and shall have the oversight of the affairs of the Association, the appointment of its meetings, and all arrangements for the same, including the annual meeting for the election of officers.

SECTION 6. It shall be the duty of the Secretary to keep and prepare for publication the transactions of all meetings of the Association each current year, embracing such papers as shall be approved by him. The Treasurer shall keep the charge of the funds of the Association, and shall disburse the same on the order of the Secretary, countersigned by the President, and shall report receipts and disbursements at the annual meeting.

SECTION 7. Amendments to this constitution may be made at any annual meeting, by a two-thirds vote of the members present.

ANNUAL CONVENTION.

Held at Meadville, January 18 and 19, 1882.

The President, John Cole, said:

Gentlemen of the Convention: Through the goodness of Divine Providence we are again permitted to assemble in this our annual convention, for the purpose of looking over the operations and labors of the season that is now past, and to take counsel together concerning the future operations of the industry which we represent.

When we consider for a moment, the importance of this branch of the agricultural interests of our country, we can see the wisdom of these organized efforts to promote its advancement.

We wisely meet here to discuss the various topics that are presented for our discussion.

It is necessary for farmers to mix some theory, some science with their practice, whether they are engaged in growing corn, or wheat, or grass, or making cheese or butter.

We are all interested as consumers, and most of us as producers, in building up our chosen vocations.

Now I would heartily invite every one of our new members, and our visiting friends as well, to participate in these discussions, to help us in sifting out the true from the false, to aid us in separating the chaff from the wheat, for in all conventions of this kind, we know some false theories and ideas will present themselves. Help us to cut down the weeds of error that the truth may not be choked.

The year that has just closed has been an eventful one. The winter of 1880 and 1881 was quite severe, and hung on until very late in the spring. Quite good sleighing in the fore part of April, and then when winter did break vegetation was very rapid, and pasture for the months of May, June, and July, perhaps, was never better, and dairy stock did finely, and hence there was a very large production of milk and also of cheese. The price of dairy products was quite satisfactory and everything appeared to be moving prosperously and harmoniously, when the sad news was flashed over the wires throughout the country that the President of the United States had been murdered by the foul hand of the assassin, which cast a gloom, not only over the entire people of the United States, but over the whole civilized world. Only two days before the anniversary of our national birthday this vile and wicked crime was committed, which compelled the people of our entire country to wear a look of sadness and sorrow, which has never been equaled but once before in the history of our country, and we may hope that the people of the United States may never be called upon to witness such a crime again. But the President was not dead, but lived nearly eighty days with terrible suffering, and then passed away, and whatever conclusion the Washington jury may arrive at, the verdict of the people throughout the entire civilized world will be that the assassin pay the extreme penalty for his vile and wicked crime.

But we must not forget that it is with the farm and the cow that dairymen have to do, and I think the future success of dairying in this country lies in our ability to cheapen the products of the cow, milk, butter, and cheese, and this can and must be accomplished by a better class of dairy stock, by better care, and by the improvement of our farms and of our management of farming, in order that we may produce larger crops of grain and more and better crops of grass. Until we have herds of dairy cows that will produce more than three thousand pounds of milk in a year, as now, we can hardly expect to make dairying a success.

The first thing under consideration, is the cow and her improvement—how can we improve her milking qualities? Shall we sell and depend on buying in order to get better dairies? My own experience in this direction has been a failure. I think the correct way is to breed. For this purpose, select from among your herds those cows that are known to be the best milkers, and breed them to a sire that is of known first-class milking properties, and then raise the calves, and raise them well, and when old enough for cows, there will be some good ones. Keep them for milkers, and send the poor ones to the shambles, and keep on breeding in this direction, always breeding from a thorough-bred sire. And while speaking in this direction, I would mention some remarks made by the Honorable T. D. Curtis, of Syracuse, at Cedar Rapids, Iowa, at the late convention, who read a paper on "Some Needs of the Western Dairymen," in which he advocated the need of better dairy stock, and its better shelter and keep. He advised every dairyman to put himself in the way of raising his own dairy stock from his best milk cows, using on them a full-blood male of a known milking family; he also suggested the formation of new breeds better adapted, than the imported, to American uses; he gave testimony to show that all breeds have been originated by careful and close inbreeding, and then mentions the herd of Truman A. Cole, of Solsville, New York, being the only attempt of this kind made in this country, whose American Holderness cattle are entitled to be a breed and a success. I think this herd consists of twenty-eight head, and have produced three hundred pounds of butter on the average per head in a year.

Breeds.

From what breeds shall we select? I answer, from any and all breeds, because there are good and deep milkers among all breeds. Those dairymen who have the Short-Horns, think them the best; those that have Jerseys, think them the best, and those who are interested in Herfords or Ayrshire and other herds, think them as good as any, if not the best. Some one has said that there are more Holsteins in the United States that produce over fourteen thousand pounds of milk in a year, than all other breeds put together. This speaks well for this breed, and when we have done all that we can do in order to bring about the improvement that we desire, if we neglect to provide for all the wants and the requirements of the cow, if we do not furnish her with all the nutritious food that she can manufacture into milk, then we fail to accomplish the desired result, which is to cheapen the products of the cow, milk, butter, and cheese.

I think, by a wise system of selecting and breeding, we can increase the quantity of milk in our herds from less than three thousand pounds to nearly six thousand pounds per year; but this cannot be accomplished without an improvement in our farms and farming, until we learn to produce more than one ton of hay to the acre, as is now the case. In some instances we an hardly expect to make dairying a success. When we reflect that it takes from one to three acres of meadow land, and from two to four acres of pasture land to keep a cow one year in feed, and her product is (less or) only three thousand pounds of milk in a year, you may draw your own conclusions in regard to profit.

The great and important question of producing the food for the cow must be considered. This must be cheapened, and in order to cheapen the food we must raise larger and better crops of grass and whatever other crops we produce for food for the cow. We must cheapen the food in order to cheapen the products of the cow. This can and must be done by manuring more liberally, using more fertilizers, and by better and more thorough tillage and cultivation of the soil. We must produce more manure, and stop our wasteful habits in regard to manure. It has been said by some that the dairymen plow too much. This may be so in some cases, but I think in many cases they do not plow enough. They have nothing to bed their stock with, and hence have nothing to produce or to save manure with. I want an abundance of litter of some kind, and I never found anything more convenient and better than plenty of straw. Without this most important factor, manure, we cannot hope to increase the fertility of our soil, nor to raise larger crops, but if we only use the means at our hands, and produce all the barn-yard manure that is possible, and then use a limited amount of commercial fertilizers, we can double the amount of grass and other crops.

But there is another point in this question. The necessity of dairymen providing some kind of soiling crop. Dairymen have many times been admonished that it was necessary to provide against short crops of pasture, caused by drought, and perhaps this past season taught them a lesson that they will not soon forget. We have had the most severe drought perhaps that we ever experienced in this country. The pasture grass at one time was nearly dried up and dead, and corn wilted and dry, and everything seemed to be parched up with the drought.

I think for a soiling crop, in time of great drought, red clover, millet, or Hungarian grass would be better than fodder corn, because they appear to stand the drought better. I noticed one or two fields of Hungarian grass the past summer, that were green and nice for food when the corn was entirely dead. But let dairymen provide some or all of these crops in order to furnish dairy stock a full supply in time of short pasture.

Cow as Queen.

It was claimed for a long time that cotton was king, and I think it was conceded, but after a time it was claimed that corn had superseded cotton, and the crown was transferred to corn; but it is now claimed, with good authority, that the cow has become superior to cotton, and corn, and must stand at the head of sources of agricultural profits, hence the crown must be placed upon the cow, and she must be crowned queen.

The following table is a comparison of receipts and exports from May 1, to January 1, for four years:

	Receipts, pks.	*Exports, lbs.*
May 1, 1881, to January 1, 1882,	2,551,566	104,623,466
May 1, 1880, to January 1, 1881,	2,506,2.9	110,215,557
May 1, 1879, to January 1, 1880,	2,270,407	99,457,314
May 1, 1878, to January 1, 1879,	2,979,338	115,312,084

By this table it will be seen that the receipts in New York from May 1, 1881, to January 1, 1882, was larger, by 45,347 boxes, than from May 1, 1880, to January 1, 1881, and for the same time the exports were 5,592,091 pounds less. The exports from May 1, 1881, to January 1, 1882, exceeded those from May 1, 1879, to January 1, 1880, by 5,592,091.

Table showing the amount of stock in this city on January 1, 1882, as made public, was 233,308 boxes, of which 184,388 boxes were Cheddar, 43,920 boxes flat shapes, and 5,000 boxes of various shapes.

The following table is a comparison of stocks in New York, Liverpool, and London on January 1, for several years:

	1882. *boxes.*	*1881.* *boxes.*	*1880.*	*1879.*
New York,	233,308	214,191	194,758	396,467
Liverpool,	177,700	96,007	63,510	180,000
London,	70,000	90,000	70,300	70,000
Total,	480,308	400,198	328,568	646,467

Thus it will be seen that the amount in the three great markets was, on the 1st of January, 1882, 80,110 boxes greater than last year, and 151,740 greater than in 1880.

Number of Cows.

The number of milk cows in the United States in 1880, according to Commissioner Loring, was 12,442,137. Suppose that these cows produced three thousand pounds of milk each in one year, we have the vast amount of milk of 37,326,511,000, and at one cent a pound it would amount to the vast sum of $373,265,110. Then why should not the cow wear the crown?

Exports of Oleomargarine.

Exports of oleomargarine from New York to the under mentioned ports since May 1, 1881, and for the week ending December 28, and for the same time last year:

	1881.	*1880.*
Liverpool,	201,608	666,595
London,	9,840	41,937
Glasgow,	1,454,391	1,063,718
Bristol,	47,080	164,430
Rotterdam,	3,106,500	4,868,117
Antwerp,	980,295	485,870
Hamburg,	28,930	80,724
Bremen,	40,130	81,712
Other ports,	797,610	332,174
Totals,	6,661,384	7,735,277
		6,661,384
Falling off from last year,		1,073,893

Now to return to our work, I think the Association will now be in a situation to accomplish more good in some directions than heretofore. It has been hampered for means to work with. Now we have some funds for practical use, and it is proposed to do something to encourage practical experiments.

H. C. GREENE said: Whether the Association has been worth what it has cost to its members, is not for me to say, but there seems to be a sort of slackness in supporting it as it should be supported by its members. A change is recommended in the Constitution, by which a person who pays one dollar becomes a regular member and need not be called upon nor assessed for further fees. If a person wishes to pay only fifty cents, he becomes a member for one year. A change has been recommended also in regard to the nominating of officers, each individual having the privilege of nominating any person he may choose. The roll of members will then be called, and those only who are members will be expected to vote. Hitherto officers have been elected *vive voce.*

DISCUSSION ON MIXED FARMING.

JOHN FULLER. Mr. President, I had not anticipated saying much on this subject. It has been well handled and well discussed in the papers we have just listened to, and I shall not attempt to take up all the points those paper have treated, but I shall consider mainly one point, and that is mixed farming. Now then, understand I would be in favor of mixed farming, possessing, as the first speaker on the floor does, a territory of three or four hundred acres of land to work upon. It is almost a necessity upon that amount of land, for there is hardly any branch of farming that we can take exclusively, because it becomes unwieldy. But with the great majority of farmers throughout the country, they have to ask the question a good many times, "what shall I do to be saved" and make a living? And the answer comes back, that we have got to work at something to make a living, and with least risk and labor it is policy to work where we can make the most dollars and cents.

Now then, the mixed farming is a little like the man who is a "Jack at all trades and good at none." The farmer who raises a little of everything seldom ever raises much of anything. He is not very proficient in any one branch, and especially not in all of them, while the man that makes a specialty of a particular line of business is apt to become more proficient in that branch than the one who covers too many branches. It requires close study to make a success of farming, because in that branch dollars are not coined without hard work.

I have taken a little pains, in my experience as a factoryman, to ascertain throughout a part of the country, the extent and size of the dairies, and I have tried to find out who are the most successful producers of milk, who produce the best milk; and it is, as a general thing, the man who has his head and energies centered upon the dairy; that is, the man whose whole force of farm and capital is in that direction; and the source from which our poorest product of milk comes is from the small dairy, from the man who attempts too many things. He attempts to run a mixed farming on fifty or a hundred acres of land, and, as a rule, he keeps six or seven cows, raises a few sheep, a little corn and wheat, a few young cattle, and five or six calves, and sends his milk to the factory from the 1st of June till about the 1st of September. In other lines, he has not much, and has not much interest in a dairy. He sends his milk to the factory to get rid of it at home. If it don't happen to be as much as the man's who has taken care of his cows, there is some fault with the factory, and the next year he goes to another factory. Now, then, the size of the dairies, as an average throughout the factories of Crawford county, won't exceed six cows to the dairy. The greatest average of these small mixed farmers is not more than from three to six cows, and this has proven the great drawback to the interests of dairying in our part of the country.

J. B. PHELPS. I am a little bit surprised in regard to the course my friend Fuller has taken. I supposed he would speak in favor of mixed farming; therefore, if I should happen to say something he has spoken of, it must be true, because out of two or three witnesses, it should be established. I think myself, and have always thought, that every man was not created for one purpose. I look up and down the world, and find man engaged in one business, and he proves a failure, because he is not adapted to that pursuit. He may, before he dies, resort to something befitting his taste, and succeed, and make some money. We find men engaged in professional business who can't be farmers. They are not educated in that way. We see men as mechanics who cannot be farmers. We find men engaged in farming who have been educated to it all their lives, and yet they are not a success. What does it prove? It proves that we are adapted to a certain pursuit, and that pursuit should be followed to its extent; not only should be followed, but should be studied. I believe that the grand hindrance to dairying in Crawford county is mixed farming. I have studied this thing, and have been engaged in the dairy business for eleven years, and made it a specialty. Previous to that, I was not a success in mixed farming. I did not make a specialty of one thing. I worked at all branches, and was not a success at any of them; was a sort of "Jack" of all trades and master of none.

Since I have been engaged in dairying I have grown more and more in the knowledge, and have met with better results. I noticed what my friend Fuller said before, that those patrons that are engaged in mixed farming as a general thing whine most in regard to success. You may take any other business. Take the merchant and let him follow everything and see if he will make a success in merchandise. The man engaged in mixed farming, says: "I am going out of the cow business." Why? "Because my sheep netted me a great deal more than my cows last year." You may take a flock of sheep and turn them in with cows—the cows will do nothing, and the sheep will thrive. Then the farmer curses the dairy business. Keep a separate account of what "Old Brin" does, and see her come out ahead. The great bane of dairying is the idea that mixed farming is the plan. Eighteen twentieths hold that idea. It must be driven out of every man's mind. Now then, to prove this, go for instance to Herkimer county, New York State, and Lewis county. They have been engaged in dairying for I don't know how long, years and years. Are they engaged in mixed husbandry? They don't know anything about sheep, but can tell you all about a cow. You will find dollars there where you find cents here. As I said before, I hope the people will argue this subject not only here but elsewhere, those that believe this to be so, and try and convert the people of Crawford county out of the idea of mixed farming. If we build up a dairy section, and make a specialty of it, we will be ahead of them in the line of production, because our soil is as good and in many places better.

HON. O. O. POTTER. Considering the lateness of the hour, and the amount of talk that has been made upon this subject, there is no manner of doubt but that everybody is ready to drop the afternoon discussion. But as I have been called upon, I suppose that, in order to fill out the programme, I must talk a little, say ten minutes, but I wont occupy over ten minutes. This thing is a matter to be governed by the circumstances of each special case. The farmer of limited means and limited acres can probably make the most money in the specialty of dairying. In other words the average farmer had better stick to the cows, especially if he has a taste in that direction. I remember a philosophical old friend of mine, who used to say of a man's boy, who inquired what he better make of himself, "He better let the boy select for himself, because it is a difficult thing to make a whistle out of a pig's tail." Where a man has a taste for milking cows by all means milk the cows. The man who sticks to the dairy is the man who makes the most money in the long run, and when, year after year, he has added to his broad acres, he may consider something else. When a man has sufficient acres to warrant it, he may have something in addition to the dairy. It is very convenient, when the wool-buyer comes around, to have a thousand pounds of wool to sell. It is very convenient, when the butcher comes, to have some fat mutton. So if he happens to have a colt or two, it is very convenient to have them to turn off when the horse-buyer comes. So I say with regard to mixed farming, it is very well to have these dairy products to realize from. One great advantage to the average farmer, the man of limited means and limited acres, is that he receives the money in quick returns. You milk your cows and almost simultaneously you receive the money to pay your debts. That comes very timely to the man of limited means. That is the way in which—and I have known it to be the case—the average farmer adds to his acres. But dairy-farming, as I believe has been suggested here, necessarily involves mixed farming. A man can't carry on dairying unless his business is that of mixed farming. He can't keep his cows without grass. He must have his grass in summer and needs it in winter. He must have grain sufficient not only for his dairy but also for his family. When a man commences the dairy business he must commence mixed farming, although not extensively. But that it involves mixed farming is a palpable fact. A man can't keep cows without it. It seems to me, as I understand from my limited experience and observation, and ability to comprehend, that this is about all. As a man grows in wealth and his farm increases in size, it is the most natural thing in the world to increase his flock of sheep, his number of horses, to increase his breeding. Why my experience is this, that a greater care with regard to breeding is a thing neglected by the average dairy farmer. I believe a thorough-bred Shorn-Horn cow may be made worth a great deal of money in the course of a season. I have sold during the past season, without any special effort of my own, one half of the calves that I raised, for three hundred dollars. That was for seven out of a herd of fourteen, and I would not take that price to-day for the seven remaining. I have tried to produce stock worthy of being well paid for, and I have been paid for them pretty well, although not extravagant prices. A very great feature of dairying, in my opinion, is to produce good calves. That opens a wide field as to whether to take the milk to the factory. I have given you my suggestions, and I retire.

T. B. WIRE. I believe the subject is not properly defined. The person farming for a special purpose farms with the idea that the money he shall lay by is to come from his dairy. He must sustain his family and his dairy, and at the same time he carries on a special business. That is the idea I get from it. You have a wheat farm. You raise wheat, but you keep some cows and take some milk to the factory for a short time, but it is only to sustain your family. It seems to me that the location, the farm, the soil should determine the course he should pursue. In the North-Western Dairymen's Association, the president of that association, Mr. Cole, said, that a man farming in a certain direction, his mind became centered in that direction, and he is incapable of doing business elsewhere. I heard an anecdote. A gentleman was at a certain place, and in came a well-dressed gentleman who was lame. He came along up to the stove. A fellow sat there filled with whisky. He said, "Mr. do you think you are all right?" "Oh yes, sir," he said, warming himself. "Are you sure you are all right?" "Yes, sir." "Then you better stand back from that stove, you are warping like thunder." So in this farming, people are liable to get their mind warped. The location has a good deal to do with it, but I believe a man should make some one thing the object of his farming.

Mr. FARRINGTON. In those very able papers to which we have listened, it seems to me that both the gentlemen lost sight of that which they designed to hold forth. They got mixed up considerably. They were good, taken from the gentlemen's standpoint. That may apply to a certain extent to the remarks which have followed the papers. Now what a farmer in this country wants is facts. It is so very natural for us to form our opinions from our own standpoints. I will just relate a little circumstance that may be profitable. I was raised in a dairy section, exclusively a dairy section. Several years ago I was called upon to prepare a paper for the Dairymen's Association. My prejudices were in favor of dairy farming. I was so firmly impressed that dairy farming paid so much better than grain farming, that I did not feel qualified to take the paper on that discussion. I took a hundred acres of our best dairy land, worth a hundred dollars an acre, to carry thirty cows, besides the amount of team, and to keep the dairy good by raising young stock. I gave the dairy five hundred pounds of cheese to the cow, and a given amount of butter besides, for times when they did not make cheese. Then I added two fifths of the gross receipts for producing this cheese and butter, as that is the customary way. Then took another farm in western New York, where grain farming mixed in with some cattle, and stock, and sheep, but the specialty was grain where that was carried on. I took pains to find out how much it cost to raise a steer until he was three years old. How much it cost to raise a good sheep, and other things in like manner. Then I gave one half of the gross receipts of the farm for producing all this so as to leave a net income. Both these farms being valued at the same price, the advantages in favor of dairying were quite large. But it was in favor of dairying, "just as I expected," as the old woman said when the cow ate the grindstone. Then I took a farm of the same value and size, and prepared a certain portion of it for raising wheat with a rotation of crops. It occurred to me that in all our dairy farms we have more or less land that is better calculated for some crops than for grass. Well, I plowed part of that land, and raised corn, then barley or oats, and then wheat, and seeded it down, and I proceeded to keep the given amount of young stock in order to keep up the dairy. When I got through, and struck the difference, the mixed farmer had the advantage. If this is true, it should be shown; if false, that should be shown.

I will refer you, gentlemen, to a fact. Fifteen or eighteen years ago Canada commenced dairying. Before that it had been grain farming and stock. It commenced just as it is running here, small dairies from three to ten cows. At that time there were private dairies in different portions that kept fifty cows, perhaps. Now their land, as you are aware, is wheat soil, though little grain is raised. I learn from observation in visiting that location from time to time, that they are actually producing more grain than they did when they commenced dairy farming. Their barns are not large enough to house their crops, and all that they receive from the dairy is ahead. And they are improving their farms all the time. Let us bring out these facts. This is an isolated case. I don't know of another so striking.

A VOICE. How would that compare with the assertion that many dairymen plow too much?

That does not follow. They have to plow some of course. It is better for them to keep more stock, and it is better for them to put that stock in the dairy, because they have nothing else they can do with it. To the dairy farmer it is better to raise what he consumes with his team, and if he has land enough he can just as well use his help to produce a surplus of grain and sell it. Then he has done something towards mixed farming. A specialty is one business from which the producer wishes to procure a livelihood. What grain he raises for himself may not be considered mixed farming, and yet may he not do this?

A VOICE. Mr. President, I am led to exclaim, instead of "What shall I do to be saved?" "What shall I do when I am lost?" I am lost, and I would like to ask these gentlemen who spoke in favor of special dairying, how they get along? How do they manage their business? whether they don't plow any or do?

JOHN FULLER. The question is a very important one and I think it can be answered briefly. I will call upon Mr. Phelps to make a statement which he made to me to-day, in regard to what his herd has done this year.

MR. PHELPS. I suppose it was understood, that the specialty admitted of raising stock enough for his own use. You remember, I do not say that every man should be a dairyman. I don't believe that every man should be a dairyman, by any means. A man engaged in special dairying may raise enough stock for his own use. Not to raise sheep, neither young cattle, more than enough to supply his dairy, that is all. I don't believe in raising wheat to sell, but mixed farming is this, all kinds of farming, raising cattle, sheep, colts, calves for sale. We have men, lots of them, that are in that same kind of business. They have six or eight cows and some sheep and colts, and they claim that is just the plan. They get a good living and make no specialty of it at all. They don't study any one pursuit. They ought to take one persuit, and follow it, like the dairyman is doing. Ask them to-day to come to this convention or association, and they say it don't amount to anything. They are traveling in the wilderness. To speak in regard to my own, is not to boast, for I was called out for that purpose. I keep about twenty cows. I heard something at this Association that set me thinking a great deal. The question came up about two years ago, when cheese was selling at two cents a pound, what can we do? We have got to do something or go out of the business. We could not sell cheese at that price and live. We have got to double our production; make the same cows give more milk. Now, then, the test came, to see whether our cows were doing what they ought to do. I started out with twenty cows in the spring, and weighed their milk every day. There were cows I supposed to be giving a good mess, that were not supporting themselves. I got rid of them; others followed in the same line. I kept fifteen through. I followed that plan, and kept shifting, getting better cows, regardless of price, until this last year I thought I had a pretty good dairy of nineteen cows. Last evening I figured up what they were doing this year. The quantity of milk that I received from nineteen cows this year, commencing the 25th day of April, and ending on the 11th day of November, was 81,774 pounds. I figured upon the butter that I made and the calves that I sold from the herd—mark you, that I never give a calf anything extra—the calves and cheese, to say nothing about the pork. They are going to bring me in over fifty dollars a head this year. I also retained milk enough for two families and they have made over fifty dollars a head. I attribute this improvement in my herd to ideas I received at this convention.

A VOICE. Mixed farming has not been defined. The definition has not been distinctly drawn. Dairying involves mixed farming. There has got to be a great deal of farming done besides the cow milking.

A VOICE. Can you raise good calves on whey, without anything else?

MR. PHELPS. Yes, sir; those cows that make the best calves come in early in March. Then, by the time the factory starts, I put them on whey, and have never given any milk. I give them whey, and am very careful not to give them too much. I do not give it to them sweet. They get the whey one day old. Very many of my patrons who see my calves say:

"You give them the whey sweet." Now, that is not so. But there is one trouble—most people have it in their heads that whey is worthless, and so feed it in great messes. Soon it overloads the stomach, and the calf has the scours. They might as well pour it into a rat-hole. I sold half of mine at ten dollars a head.

A VOICE. Mr. Chairman, there is one thing very important to consider. I would ask Mr. Phelps if he fed his whey sweet. Some farmers say it will kill their calves. My experience and observation teach me that there is a great difference between the whey in producing pork and calves; between it sweet, as it comes from the vat, and sour, as it often is when a man takes it home and leaves it in the broiling sun. Now, there is as much difference between this whey as there is between sugar and vinegar. Now, you know, there are fattening properties in sugar, and the girls sometimes take vinegar to make them look thin and lady-like. Now, I defy any farmer to take whey that the factory man leaves in his vats, and take it home in the morning, and leave it in the broiling sun, and raise good calves on it. Mr. Phelps takes his home at night. When I was making cheese, farmers used to set a barrel under where the whey run out, and get the whey, and they raised good calves and pigs.

O. O. POTTER. You can kill a calf by feeding sweet whey. But will acid fatten as fast as saccharine? I take pains to feed my calves sweet milk and my hogs sweet whey, and all there is about it is this, that in commencing with anything that is sweet, you must feed with a great deal of care until they become accustomed to it. Corn and clover are good, but either will kill a cow or horse. Whey is good, but it is poison, and if they overload their stomachs, they are tight. Feed a little at a time and feed it sweet. It is more palatable than acid, and they will thrive better on it.

Mr. CURTIS. One gentleman remarked that what is meant by mixed farming has not been defined here at all. They all agree on the leading industry, while they favor mixed farming. When the farmers settle on the prairie, they settle on a specialty—that is wheat—and in ten years their soil is run out. They can't raise wheat; so, also, with corn. Now the question rises, Can you pursue dairying as a specialty, raising nothing but grass and hay, and make butter and cheese, and keep up your farm? Would not you run your farm out? Could you keep your grass just as luxuriant as you could if you made dairying a leading industry, and raised all the wheat, oats, and potatoes that you needed on the farm? Is not that what you have all agreed upon, after all? That has been about the drift of the discussion so far.

S. A. BABCOCK. I come from Ashtabula county, Ohio, where they follow this cheese business, and the result is that we have exhausted our land. Certain soils, they say are adapted to growing grass. Now, if you come over to the Western Reserve, the dairymen claim they can grow grass. They have grassed and dairied, and grassed and dairied, and grassed and dairied until they have grassed and dairied out. Last year they began and raised a hundred thousand bushels of wheat, and they made more butter and cheese than ever before. You will see ten or fifteen acres of wheat upon a farm of a hundred acres. The manure increases the wheat and grass, and this again increases the manure, so that the thing is running in a circle, with money at every step. We followed dairying until we run our land out and now often we have our grain extra. A man needs to follow other things. He needs the rotation on all soils. If he did not he would run himself where he did not want to be.

Mr. T. D. CURTIS. You can't keep up your farm without a rotation of crops. They calculate to grow corn to use all through the year in the west.

They grow other crops in connection with their dairies. I don't think they can do it without a rotation of crops. You can make dairying the leading industry and make more money.

EVENING SESSION.

FERTILIZERS.

By E. W. SHIPPEN.

MR. PRESIDENT AND GENTLEMEN: When I received your card of invitation to address you on the subject of fertilizers, it occurred to me that the subject properly belonged to some one versed in the science of chemistry, and as I am not I had thought of declining, but the next mail brought to me a letter in response to one which I had addressed to the United States Department of Agriculture, asking "What is the value of ground limestone as a fertilizer?" In which response the chemist of the department said: "What this value *actually* would be for a particular soil can be determined only by experiment." I then concluded that the subject belonged as much to the experimenter as to any one else, and as I think I may be classed among the latter, I have accepted the invitation.

I do it not so much with a view to giving the results of any experiments which I have made, as to give you the benefit (if any there may be) of the observations which I have made of the doings of others, and to call your attention to the waste of fertilizers which I see going on around me.

In the first place, we find our soil fertile, because it was made so by nature before the hand of man extracted its fertility through its products. How to replenish the fertility in the most economical manner is the problem. Chemistry has been of great service to the agriculturist, and has shown us that the principal food of all plants consists of carbonic acid, water, and ammonia, in combination with mineral and earthy substances. Different classes of plants requiring certain substances in greater proportion than others.

Vegetable matter, when burned, leaves potash, soda, magnesia, lime, sulphates, phosphates, and silica. The light and heat of the sun, and the elements in the air and water, enable plants to decompose and assimilate these substances, and to manufacture out of them the various products they contain. Water and silica are the chief constituents of which the earth is formed, and limestone, in some form or other, is one of the most abundantly distributed minerals which we find on the face of the globe. I shall refer to the different substances, but shall speak most particularly of limestone.

The soil, to be made to produce abundantly or be kept producing, must be fed. We all know that barn-yard manure is efficacious, and by the plowing in of clover and other green crops that the ground will be enriched, but are there not many materials which Providence has supplied with a bountiful hand that are within our reach, that when used by us as we might, would make the soil give forth its fruits more abundantly. I will notice a case to the point within my own knowledge. Whilst living in Philadelphia about the year 1852, I knew a Frenchman who had then but recently come to this country, who bought forty acres of barren sandy land over in New Jersey for four hundred dollars. He enriched it with night-soil and the sweepings of the streets, carted across the Delaware river from Philadelphia, then planted it in asparagus, and afterwards gave it dressings of salt. Whilst on my way to Europe in 1869, he told me he had rented his farm and was going to France for a few years, to live upon the rents. I told him I thought he " would need to live very moderately." " Oh, no," said he, " I have rented it for four thousand dollars per year, and I think I can live in pretty good style on that."

Alongside the great Cornechi road in Italy, the barren mountain sides of the Alps have, in places, been made fertile by the peasants gathering up the droppings from the horses traveling over the road. I have seen peasants following the carriage in which I was riding, for miles, for this purpose.

I had a saw-mill running in Wayne township, about six or seven years ago, where a large quantity of saw-dust was wheeled out on a pile. Last summer I went there to renew the mill, and found a rich heavy growth of grass and blackberry bushes growing up out of the decayed saw-dust. This has led me to believe there is virtue in it, and it is my purpose, in the future, to haul all the saw-dust out over the land, not in large quantities at a time, but to give the land occasional light dressings of it.

We have other sources around us than our barn-yards from whence we might derive material for fertilizers. The vast peat beds and swamps with which our county abounds, the leaves in the woods, and the beds of many of the ravines into which the lighter portions of the soil from our farms are washed by the heavy rains, are sources whence we may derive profit.

These ravines, if not natural receptacles, can be made such by making small dams in them which could be used for the double purpose of collecting vegetable matter for plant food and raising fish for food for ourselves.

I have a deposit in the center of my farm on Big Sugar creek, where I, this summer, spent over $100 to drain off the water, where I have this winter hauled out five hundred wagon loads of material, which my neighbor farmers say they think is worth as much per load as barn-yard manure, and I estimate there are six thousand wagon loads, whilst my predecessors, for twenty years to my knowledge, had their hog pens so situated that it was the most convenient receptacle for the deposits from them.

It was but a few years ago that I saw manure from the stables of Franklin and Oil City being dumped into the French creek and the Allegheny river, as the most convenient place to get rid of it.

In all cases where animal manures are used, care should be taken that they are brought into action upon the soil as soon as they begin to decompose, or as soon as possible afterwards, and not suffered to rot and exhale their best constituent parts while lying in the farm-yard. The drainings and the exhalations of a common dung heap contain its most effective ingredients; and these are often suffered to go to waste or to contaminate the air and collect in pools of filth. The advantages and economy of long manure over *old* rotted manure when properly applied cannot be doubted.

Soda, one of the substances required for plant food, can easily be obtained in the form of common salt. Magnesia is generally found in connection with limestone. Sulphate is most readily obtained in gypsum, commonly called plaster or plaster of Paris.

Phosphate is an ingredient that we need to supply with a more liberal hand upon some of our soils than many are aware of. It is a substance which cannot be dispensed with in either the animal or vegetable economy. Bones contain fifty-seven per cent. of phosphoric acid, in the ash of cow's milk there is twenty-eight per cent., and in the ash from the yelk of an egg, seventy per cent.

The productiveness in the red sandstone loam lands of Cheshire, England, had become much impaired by the diminution of phosphoric acid, owing to the quantity taken off in grain, cheese, and the bones of animals. By a liberal dressing of ground bones it had the effect of doubling the value of their worn out pastures. On the clay soils of Suffolk the application of bones had little effect owing to their being rich in phosphates.

I would ask why it is that bones are gathered up from among your midst and from off some of your farms, and carried away by car loads to manufacturers in distant cities to enrich lands in foreign countries, or be brought back again in the form of superphosphates, with their value much enhanced.

Potash is a substance essential for all plants. It is a proverb among farmers "that the land does not soon forget a dressing of ashes."

I here read to you two items from the *New York Times*, of December 28, 1881, on the subject of potash as a fertilizer:

A mineralogist recognizes in clay soils the débris of slate rocks, which are richer in alumina (the base of clay) than in other minerals. In sandy soils he finds the débris of granite and feldspathic rocks, which contain mica. Now, mica and feldspar are essentially potash minerals, and are very rich in this substance, which exists, however, in combination with silica as silicate of potash, and in an insoluble and unavailable condition. The question then comes up, how can we make these light soils give up the potash they contain locked up in them.

Knowing the power of lime to dissolve the silicates of the soil to which it is applied, and the universal presence in both sandy and clayey soils of insoluble silicates of potash, it is only reasonable to attribute much of the useful effect of lime to this action upon the unavailable potash, by which it is loosened from its combination with silica and rendered soluble and available for plant food. So that it is really the potash which produces the effect perceived, the lime being the agent or power which enables it to act.

On my way from the station to my farm on Big Sugar creek, in Venango county, during the summer, I have noticed the land surrounding two wells which were bored for the purpose of obtaining oil. In the endeavor to pump oil, salt water was pumped over the ground. Immediately around one of them was a very luxuriant growth of timothy and clover, whilst in the same field beyond where the salt water had reached there was scarcely anything but red sorrel, and across the road was a wheat field, into and over part of which some of the salt water had flowed. By the growth of the wheat, the eye could distinctly see where the salt water had been and where it had not been. The other well was in another wheat field, and as the wheat grew up it was also plainly marked by the difference in the growth, where the salt water had been and where it had not been. The part where it had been being very much more luxuriant than the other. These fields I watched with great interest, from the 12th of April, when the snow left them, until the day upon which the crops were harvested.

This has convinced me that salt is a good fertilizer. In speaking of it to others I have been informed that farms in the valley of Oil creek show the benefit of salt water.

Lime has been used as a fertilizer since time immemorial. Kirwan, an eminent chemist of Ireland, alleges that no soil will long continue fertile that does not contain some proportion of lime. Is it not for this very purpose that Providence has so bountifully distributed limestone over the face of the earth?

Some years ago whilst I was living in Lancaster county, a friend of mine, a banker, bought an old worn-out farm in the south-western corner of the county, where there was no limestone. The principal stock raised upon it previous to his purchase were wild rabbits. He bought lime on the Tide-water canal by the boat-load, wagoned it seven or eight miles, and covered the land over with it so thick, that I then thought he would burn up what little substance there was in the soil. This was done without the addition of any barn-yard manure. A few years afterwards he sold the farm for nearly double the sum that he had invested in it.

It is but recently that ground limestone has been brought to our notice, and the subject at this time seems to be agitating the minds of many, to decide whether it is useful or not. Judging from the reports of experiments made by others, from trials of it made by myself, from what I have read upon the subject, and from what I have seen, I am no longer in doubt about it.

I believe it is generally acknowledged that limestone lands are the best farming lands. Is it not from the travertine that abounds in the Campania, the plains of Italy, that it is renowned in history as being the most productive land on the face of the globe? Is it not from the calcareous nature of the soil of the island of Cuba that ever since the morning when Columbus exclaimed " it is the most beautiful land which eyes ever beheld," that it has ever since been called " the garden spot of the world?" And is it not owing to the limestone in the land of Lancaster county, that it is called the garden spot of Pennsylvania? And the same of the Blue Grass region of Kentucky?

In the scoriæ and ashes on the sides of the burning mountain of Vesuvius and within the walls of the once buried city of Pompeii, I have seen as luxuriant a growth of grapes and cabbage as I have ever seen anywhere, and I doubt there having been much barn-yard manure applied there.

I here read you an item from the Cleveland *Leader* of December 18, 1881:

The richest person to-day upon the Sandwich Islands is Claus Spreckles, of Honolulu. A few years ago he was laughed at when he purchased ten thousand acres of land for ten cents an acre, as the tract was at the foot of an extinct volcano, and covered with a crust on the surface like a flag-stone walk. He broke up this crust, mixed the dust with a small quantity of vegetable mold, thoroughly irrigated the soil thus formed, and planted sugar cane. To-day he is a millionaire.

During the last summer I have been trying raw limestone upon my farms, but I have not, like Mr. Reed, of Erie, measured the land, weighed the fertilizer, nor weighed the crops. I put some ground Lawrence county limestone upon land which I bought in April, and put it upon fields which the neighbors said had not yielded the former proprietor sufficient to pay expenses. I think this former proprietor did not have faith in barn-yard manure, for he it was that dumped the hog manure into a stream of water, and sold the stable manure from six horses to a neighboring farmer.

I obtained a fair yield of oats, considering how badly the farm had been managed, and I was a little disappointed in not obtaining more.

I sowed sixteen acres with buckwheat. Part of it was drilled in with superphosphate, part with ground limestone, and part with the buckwheat alone. The parts with the phosphate and lime looked a little better than where there was none, but owing to its having little or no rain from the day it was planted until it was harvested, the whole was poor enough.

On another farm, I spread some fine limestone, direct from the quarry, over a part of a clover field, after the clover had advanced so far that I thought perhaps I might be doing more harm by the horses' feet and wagon wheels than the limestone would do good. I was disappointed in the first crop, as I could not observe that it had done any good. When the second crop of clover came to maturity, it was plainly visible to the eye where the limestone had been put and where it had not. A neighboring farmer, who was mowing the second crop for me. called me into the field to look at it, saying that "he could tell by the operation of the machine when he passed the dividing line from that part of the field having the limestone upon it to the part without it." I put some upon an old worn-out pasture field. The summer being dry, it at first did not seem to do it any good; after the fall rains, it had the best growth of grass upon it that there had been for many years. In passing over the fields on the 28th of December, I picked up some of the large pieces, (it had not been sifted or ground,) and noticed that immediately underneath them the ground was as black as my coat.

In conversation with Mr. John F. Nelson, of Fairfield township, during last summer. he remarked "that he was much troubled with red sorrel upon his land." I told him "that I thought fine limestone would cure it." He immediately related to me that his uncle, who formerly owned the farm where he is now living, forty years ago hauled a number of wagon loads of fine raw limestone during the winter, from a quarry in Wayne township, where the late Mr. Edward A. Reynolds had obtained the stone for use at Liberty furnace, and covered one of the fields over with it. In the spring, he planted it in corn, which did not yield an average crop. In the fall, he sowed it in wheat, and had such a crop of wheat as he had never had before; and up to this time, it is the best field for grain of any kind, especially for wheat, that I have on the farm." I then said to him, "How about the red sorrel on that field?" To which he repied, "On that field I am not troubled with it." I have here his letter of December 10, verifying what he said in the summer, with the exception that in the letter, he puts the time forty-one or forty-two years ago.

The samples which I have before me are the same kind as used by him, and of which I had about one ton ground at Messrs. Gill & Shryock's mill last May.

Last spring I gave some ground limestone to Mr. John Case, a market gardener at Sugar Creek Station, for his experiments. He writes to me, under date of December 15:

"My experiments last season with fertilizers on cabbage were as follows: I prepared the ground by making holes about six or eight inches deep, into each of these I put about one pint of well-rotted stable manure, mixing it with the soil. With the two first rows I used about one tablespoonful of superphosphate to each hill, the next two about as much of Mr. Shippen's fertilizer (the ground limestone I gave him) as I could hold in one hand, to each plant, the next two rows a handful of ground limestone (Clarion county limestone) to each plant, the next two rows a handful of Crawford county marl, the next two nothing but the stable manure. The rows with the phosphate were about one week earlier than any of the others. Mr. Shippen's fertilizer was next—ahead of the Crawford county, and also the ground limestone."

The ground limestone which he refers to was from Emlenton, Clarion county.

Mr. McKissick, the superintendent of the Venango county poor-house farm, last summer used one car load of ground limestone, and says he had good results from it, and that he has such faith in it that he will use more next season.

The limestone to which I refer as used by Mr. Nelson and by myself, on my clover and pasture field, and also that used by Mr. Case, which he terms

Mr. Shippen's fertilizer, were from deposits which were found in Wayne township. The one from which Mr. Nelson obtained his was exhausted many years ago. The one from which I obtained mine was discovered last spring. This limestone is very different from the common hard rocky limestone. Geologists give it the names of *Calcareous tufa* and *travertine*, which is nearly identical with limestone, but is distinguished by its spongy or cellular structure. It is deposited from springs of water holding carbonate of lime in solution. It is very soft, brittle, and friable, and has the property of retaining water. Some of it, when first taken from the ground and exposed to the air dissolves or slackens like lime. I submitted some of it to the chemist of the Smithsonian Institution at Washington, who says "it is an excellent fertilizer." I also submitted some of it to the Department of Agriculture at Washington, and, as before stated, the reply from the chemist was, "What the value *actually* would be for a particular soil can be determined only by experiment. I sent some of it to Mr. J. Blodgett Britton, an analytical chemist of Philadelphia, who has had much experience in analyzing limestone for iron furnaces, who reports that it contains ninety-six and five one hundredth per cent. of carbonate of lime and ninety-eight one hundredth per cent. of carbonate of magnesia. Mr. Britton, in his letters to me, says, "the stone is above the average in purity, is much more soluble than the ordinary limestone, and will certainly answer well for the purposes of making mortar and fertilizing. Not many furnaces can command so pure a stone. In eastern Pennsylvania the average stone will probably reach about eighty-three per cent. carbonate of lime."

I have heard men who have tried ground limestone last summer, assert that they could not discover that it had any effect upon their crops. May there not be something in the kind of limestone used, whether it was readily soluble or not? and perhaps it may have been owing to the season or the mode of application, or the winter frosts not having acted on it.

It has been asserted that raw lime contains forty-six per cent. of carbonic acid. It is a well known fact that it does contain carbonic acid, the very element required for plant food, and which is driven out by burning it, and which must again enter the burned lime by absorption from the air, before it can be used as a fertilizer. The question arises whether by grinding it, is the carbonic acid in it made available for plant food? I believe that it is, and I hope to get one hundred tons of it spread over my land by the time the spring plowing begins.

Lime is more soluble in cold water than in warm water, then may not limestone be more soluble by the effects of the frosts of winter than the heat of summer.

Before closing, allow me to read to you an extract from Leffel's Mechanical News, being from a report of a meeting of the Polytechnic Association of the American Institute, held in the Cooper Institute, in New York, November 17, 1881. The subject being *lime* in the arts:

"The regular subject, "Lime," was opened by Dr. Vanderweyde, who presented the generally accepted theory for the formation of limestone proper; the presence at early periods of a strong solution of lime, and an atmosphere strongly filled with carbonic acid, all at a high temperature. The solid particles of carbonate produced at the surface by the contact and chemical union of these elements, settled and formed at the bottom beds of lime rock proper. Marble was a later formation, from the aggregation of the remains of minute shell-fish. He explained the principal forms of sulphate, the combinations of sulphuric acid with lime, plaster of paris;

also phosphate of lime, inorganic, apatite, and organic, the beds of bones in South Carolina being used as fertilizers.

All stone is soluble. The limestones and marbles are quite appreciably so. The marble columns of Girard College have the flutes on the outer side, appreciably duller to-day than those on the inner side. The outer side is more exposed to the soluble effects of rain.

He had been at some pains to test the rain-water trickling down on the outside of the columns of Girard College. When it was concentrated by boiling to one fourth its natural volume, the ordinary sensitive test, oxalate of ammonia, showed distinct traces of lime in the water. That lime had been dissolved from the solid substance of the column. But marble was sufficiently durable for ordinary buildings. It would probably stand in this climate for twenty centuries.

Prof. Dunn explained the theory of mortar. Roasting in kilns drove out the carbonic acid from the carbonate of lime, whether in the form of limestone, marble, alabaster, oyster shells, &c., made quicklime, oxide of calcium, more or less mingled with other matter."

My first visit was made to Philadelphia in 1844—thirty-eight years ago, and then witnessed the men chiseling the flutings of the columns as the stone laid upon the ground, and I think that it was several years after that time before they were put in place.

It has been but a few weeks since I read an account of the falling of a large piece of brown sandstone from the front of the old Masonic Temple, on Chestnut street, Philadelphia, which crumbled and fell, owing to the action of the sun, air, and rain upon it. This building has been put up within my recollection.

You have probably noticed sandstone bowlders having pieces of iron ore in them, and seen how the sandstone has been worn away by the action of the elements, leaving iron ore protruding from them. If any of you have not, then I would call your attention to these specimens, which I broke off a few days ago.

Can you doubt from this evidence that the dissolution of the finer particles of limestone which were spread upon the field on Mr. Nelson's farm, has been going on in a greater ratio?

Now, gentlemen, I will close, by saying that I believe in experiments; the world is progressing from the results of numerous experiments in every line of business. I would have you make your own experiments, not in a large and costly way, but in a manner that you can satisfy yourselves whether the matter you desire to know about is beneficial or not. I would have you take some of each article offered you as a fertilizer, if but one peck of ground bones, or salt, or limestone, and put them over small pieces of ground, over different crops, near your houses where you can observe them and watch the results, but do not look for results too soon. Watch what will be the result this year, and the next, and the next.

Discussion.

A VOICE. Have you been in the habit of using burnt lime? If so, what were the results as compared with the ground lime?

MR. SHIPPEN. I have not been in the habit of using burnt lime. I have been more or less connected with farmers. In my early days I was six years in Lancaster county. There we used a great deal of burnt lime, but in those days ground limestone was never spoken of.

A VOICE. In your essay you told us, in burning lime, carbonic acid escaped. Then before this was valuable as a fertilizer, it must absorb the acid again. Will it absorb in a given length of time, will there be as much taken up as there is in the ground lime unburnt?

Mr. **SHIPPEN.** I am unable to answer that question, but I am under the impression that there is not as much taken back as there was in it before t was burnt.

A **VOICE.** What was the character of the soil on which you say that salt water was pumped?

Mr. **SHIPPEN.** The soil was rather a gravelly sandy loam. It was on the side of the hill on the second bench of the valley of French creek, at an elevation of twenty or thirty feet.

Mr. **CURTIS.** Certain persons have not had good results from limestone. Might it not be that that land did not need limestone?

Mr. **SHIPPEN.** That may be.

A **VOICE.** I understand that the limestone to which reference was made was ground limestone.

Mr. **SHIPPEN.** I have tried both kinds. I have here a very singular deposit which was found in this county, the only stone found in this county that I know of. It contains ninety-six per cent. of carbonate of lime. I had it analyzed, and here is the piece from which I sent to the chemist.

Mr. **CURTIS.** The reason of asking my question, was the fact that people put fertilizers on land often where that kind of fertilizer is not wanted. It depends upon the character of the soil what kind of fertilizers should be used.

A **VOICE.** What is your reason for salt not acting on clayey soil?

Mr. **CURTIS.** I don't know. I only know that it is a fact. The chemist also tells us that it is true.

A **VOICE.** Is it not a fact that clay soil contains more lime than any other kind?

Mr. **CURTIS.** It is true.

A **VOICE.** I understood Mr. Shippen to say, that the soda in salt was the fertilizing quality.

Mr. **SHIPPEN.** I gave you an instance of some salt wells that were bored for the purpose of obtaining oil, and it was from the effects of that salt water that the rank growth of vegetation came.

A **VOICE.** How does salt act upon the soil in producing fertility? What is the chemical action?

Mr. **CURTIS.** It is supposed to liberate principles already in the soil, about the same as lime, but we don't know what it is.

A **VOICE.** What manner do you think the best in which to apply salt?

Mr. **CURTIS.** I should use it as top dressing.

A **VOICE.** I notice in sections where limestone is abundant, that while it crops out in almost every field, farmers get it together in heaps and burn it to spread upon their land.

A **VOICE.** Where limestone exists in the greatest abundance in the soil, upon the surface, as the gentleman suggests, and beneath the surface, there, above all other places in the world, farmers learn to burn the lime and distribute it upon the soil. The question is, if this be so, why should it be necessary in this limestone region to burn limestone in order to increase the fertility, if the raw lime in its natural state would not give good results?

Mr. **SHIPPEN.** I cannot say whether this limestone permeates the soil or not. The majority of the limestone of Lancaster county is found in large deposits in quarries. whose faces are higher than the walls of this room. It is a very rocky limestone, and I have no doubt that it is mixed with other matter with sand or something that does not allow it to dissolve.

Mr. CURTIS. Probably, in those cases, it is so hard that it is not soluble enough to supply a sufficient amount of plant food. It does not follow tha all lands have plenty of lime, by any means. The soil on the top may be washed from the mountain regions. There are so many things involved in this thing that it is sometimes difficult to get at the facts.

H. C. GREEN. I think Mr. Shippen is correct in saying that the limestone of eastern Pennsylvania is too hard for dissolution. I know from being about the quarries. It surprised me that they should call that blue stone limestone. The hardest cobble stone we find in this part of the country, is a stone that if you succeed in breaking it, is blue.

Mr. BABCOCK. I would like to refer you to some limestone regions in Ohio. Those regions are rough and hard to work. They are covered with limestone. While they have coal there, I see nothing of the burning of limestone there at all. They are so rough that they go in the sled in summer time, and yet they are wonderfully productive. I notice when they plow they are rolling up that limestone.

Mr. SHIPPEN. The chemist here, Mr. Britton, who has paid great attention to this matter, is the chemist for analyzing limestone for iron works. He writes me that the limestone of Eastern Pennsylvania is eighty-three per cent. carbonate of lime. There must be seventeen per cent. of some foreign matter. What that matter is, I am unable to answer. It may hold that lime so tight that it is not soluble in its natural state. I give you the instance here of this gentleman in New York, and say that he took the rain-water that trickled down the columns of Girard college, and found lime in it. You have all noticed the tombstones in the cemetery—how the are effaced by age. Now, is limestone soluble? It exposes more surfac by being powdered.

Mr. FULLER. Is there any amount of this limestone in Wayne township, where you obtained these specimens?

Mr. SHIPPEN. There are several hundred tons.

A VOICE. How much lime do you spread on your land?

Mr. SHIPPEN. Well, I just told the men to take the shovel and wagon, and go out and put it on the field. I suppose we put on a ton to the acre. This sawdust that I spoke of in my paper, was a pile wheeled out from a mill that I was running several years ago. I paid no attention to it for the last five or six years, until this summer. I observed, when I went there, a rank growth of grass and briars.

A VOICE. Did the grass grow over the whole pile, or just around the edges?

Mr. SHIPPEN. It grew all over it.

A VOICE. What kind of soil was that taken from the swamp that was so valuable?

Mr. SHIPPEN. That was the accumulation of years. There is a pond ten hundred and fifty feet long, and from seventy-five to one hundred feet wide. It may have been part of the channel of Sugar creek at one time. The bottom has round bowlders in it. It is mostly from spring water. Part way up the creek, the springs come in, and the natural wash of the valley comes into this pond. Sixteen years ago, there was not so much muck as there is now. It is all vegetable deposits.

A VOICE. A number of years ago, I had, on a piece of land, about three or four acres of ash swamp. I wanted to cut a ditch through there, and loaded on wagons and hauled it out on higher ground. The following season, after putting on a hundred loads on an acre, covering it nearly four inches deep with that rotten wood muck, I planted it in potatoes, and found that where I put the muck, I had not as good potatoes as I had on the other side of the field where the soil was the same quality. I don't know but that it decomposed afterwards so as to form a manure. I found that it was necessary for a man to haul that black muck soil into his barn-yard and let his cattle run over it, and then it made good manure.

Mr. SHIPPEN. In regard to this muck, I have had no experience. Yes, I had when I lived over in the flats. You should take it out and let it freeze. I believe, to take it into the barn-yard would add very much to its value. I believe this muck, when taken out and mixed with lime, is good. If, after further trial with ground lime I am as well satisfied as I am now, I shall use it.

A VOICE. I don't think there is a gentleman present who does not think there is nutriment in rotten wood. The difficulty in this which I spoke of, was that it was not sufficiently decomposed. It must be thoroughly decomposed to be a benefit, on account of its absorbing all the moisture.

O. O. POTTER. With regard to sawdust, I have used a great many hundreds of loads of sawdust in my stables and yards, leaving it a year or two, and then hauling it out, using it as a top dressing for my meadows, and the results have been gratifying. Now, with regard to the effects or to the action of sawdust upon the soil. Of course, lying in the yards for a year or two it absorbs nutriment. I don't think there is any appreciable amount of nutriment in sawdust, but after the nutriment which it absorbs is taken up by the plant, the sawdust is left, forming a mulch which is first cousin to manure itself. That is the action I have observed by a large experience in the use of sawdust.

A VOICE. This question of ground lime is a very important one. Last spring I thought I would use considerable of this ground lime from Cullum & Co.'s, and I undertook to sell some, and had sold several tons. About that time there was a piece came out in the New York *Times*, stating that ground lime was entirely insoluble, and hence not in condition for plant food at all. Those persons who had bought lime, notified me that they would not take it, so that piece in the New York *Times* stopped the sale of it. The point to ascertain, if possible, is what the properties for plant food are. I am unable to give favorable results from what I used. I used some phosphate and some lime, and I could see no difference as to where the phosphate and the ground lime was, and where there was none.

Mr. CURTIS. It strikes me, that there are different kinds of limestone. The blue limestone would be worthless. But this is a deposit from lime water, and I can't see why if you put it in water again it won't dissolve. The gentlemen spoke of there being no fertilizing material in sawdust. That depends upon the kind of timber it is made of. If you burn the sawdust you will get ashes, and if it is hard wood you will get potash. If you leave the sawdust until it decomposes it does burn.

Mr. SHIPPEN. Some limestones are soluble, others are not.

Mr. CURTIS. Perhaps you remember that some years ago there was quite a controversy about mineral superphosphates, and those made of bone. It was claimed that the mineral deposits were not soluble, while those made from bone were.

Mr. SHIPPEN. I went to the deposits where this limestone is. I had a man working for me who had been a plasterer. He said, "Mr. Shippen, this seems like fresh lime. It draws my hands up, just like lime. It smells just like fresh lime." I am not here with this lime offering it to you as a fertilizer. I have none to sell. I have found a small deposit of this on my own ground, and I am going to try it. If every man in this room would tell me it was not a fertilizer it would not stop me. I have been reading on this subject.

A VOICE. Some two or three years ago I got some ditching done. The ditcher threw the poor soil over beyond the good soil, and when the ditch was filled up, it left the sub-soil on top. The land was planted to corn, and I found that this sub-soil grew the best corn in the field. It was so contrary to my expectations and teaching that I was surprised. I ask you to show why the corn grew there more luxuriantly than elsewhere.

A VOICE. Might not that have been the marl?

A VOICE. Last fall there came a car load of lime to Jamestown, and I was going to try it. I went down there, but could get only twelve hundred pounds. I got the remainder of my load in phosphate. I put the twelve hundred pounds on a little over an acre. The phosphate is a far larger growth, and looks greener than the limestone wheat does. It looks short, is not large at all. It may come out in the end, but it don't show very prosperous now.

A VOICE. I have had considerable experience in some fertilizers, but not in limestone. However, a year ago last fall, I drilled four hundred pounds of limestone upon a piece of wheat. I don't say the limestone made it poor, but it was a poor piece of wheat. I will say, however, that some benefit has been derived from burnt limestone. One man told me of buying limestone years ago. He put a good load upon an acre, and he said to this day that field could be picked out on his farm.

A VOICE. I might also state, that at Jamestown men used extensively of limestone. This year they ordered a car-load. One man used five tons of it. A man in Portage county told me that he used it, and did not like it because it made his wheat lie down. I thought that might be good evidence of its utility.

A VOICE. What kind of soil is the burnt lime most beneficial to?

MR. LEWIS. I should put it on a clayey soil. I would put it on the surface.

A VOICE. My experiments are not through with. I have just commenced drilling in. Of course it is not time to see much results yet. I drilled alternate strips of ground with lime and salt this fall. I can see no appreciable difference in the effects of it. Where I drilled the salt I saw some effects. I drilled about one bushel of salt to the acre. Light and all as it was, it injured the coming up of the wheat.

MR. SHIPPEN. Mr. Potter spoke of sawdust. I said I expected to haul the sawdust out. I don't expect to haul green sawdust out. I am going to take the pile of sawdust that lies at my mill, and haul it out. I think there is nutriment in this sawdust; whether it gain it from the air I don't know, but there is a growth of grass on that sawdust. When sawdust is put in a pile it will heat. It decomposes, burns up.

S. A. BABCOCK. Mr. President, this subject of fertilizers is one that interests us on the Western Reserve. I might say to you that I hail from Ashtabula county, Ohio—the eastern part, noted for its dairy interests. We have daried until we are pretty well exhausted. What are we going to do about it? We must do something, if nothing more than to give the land back to the original owners. In 1879, in connection with a firm of Cleveland, I was induced to ship in a car of superphosphate made at Detroit. I used it on my own farm and on other farms. I also bought a drill to drill this in with. From those experiments I have gathered a great deal of thought and experience. This has been of value to me. The first I put upon my own farm was with four and a half acres of wheat, in 1879.

Part of this load was bone meal. I drilled about two hundred pounds to the acre. I drilled upon one land bone alone at the rate of two hundred pounds per acre. On the next I drilled phosphate alone at the same rate. The next I drilled with bone and phosphate mixed at the rate of two hundred pounds to the acre. Then I opened up my drill and put on four hundred pounds to the acre for half a land, and on the other half six hundred pounds to the acre. On the next I did not put anything.

The result was that that portion drilled with the bone and that with the phosphate I could see but little difference in. That portion where I put four hundred pounds to the acre was a decided improvement. That where the six hundred pounds had been drilled, was beauty to look at. That portion which had none, was spotted; some parts had nothing at all. The whole piece yielded twenty-four bushels to the acre. I did not harvest any portion of this alone. I reaped that field with a Buckeye table rake. It throws off a bundle once in thirteen feet. When we came to that with six hundred pounds to the acre it was impossible almost to bind it. That was a very desirable test, and led us to further tests. Drilling on another farm, and not being accustomed to the drill in drilling phosphate, we filled the drill every time we went around, and when we came back across the field the drill would be pretty nearly empty, and the flow of the phosphate was light. I did not have to ask which part the phosphate was on. In the fall of 1880, I put in two pieces of wheat; upon one of them I put an even quantity of phosphate and bone mixed.

A VOICE. Tell us the kind of soil.

Mr. BABCOCK. The land on my own farm is called clay-loam, with a little more clay than loam. That of my neighbor was clay without loam.

The next piece I drilled, of my own, was side by side with the other. It was an extremely hard winter. All the experiments I made with phosphates came to this one thing, that is, if they are worth nothing as a fertilizer they are worth all they cost to hold the crop in the ground from winter killing.

There were two acres in the next piece. I said, "I would fertilize one half of this." I told the boys to fertilize the other half all they wanted to with barn-yard and stable manure. That was harrowed and cultivated and worked a great deal. I put upon the other half three hundred pounds of bone meal and phosphate mixed. When I reached that part they put the manure upon I had enough fertilizer to go across the piece. I went across twice without it and then put it on. When it came up, the fertilizer was ahead of the barn-yard manure. When the snow went off in the spring there was not much difference in the looks of the wheat. During the last of March we had a tedious time with wheat. The result was, the fertilized portion was worth about twice as much as the other.

A VOICE. How do you think it benefits?

Mr. BABCOCK. I think it is because it gives it a quick growth; you can sow later and still have a crop. Phosphate alone will not raise wheat. Unless the ground is put in proper condition, it is little use to attempt to grow wheat. Two years ago I used fertilizer upon oats. I used the Farmer's Friend drill. I can shut off any portion of that drill. I shut off three holes of the drill and allowed the phosphate to run through three holes, and drilled in that manner. But I shan't do it again, because my neighbors troubled me so much to know what was the matter with that oats, that I shan't do it again. This year I put phosphate on all my oats. I drilled one piece of six acres, leaving four widths of the drill without any phosphate. With us the oats were badly smutted, and when I came to harvest mine, I thought I got pretty dearly paid for the phosphate I used. I went into the field and grasped as many heads of the grain as I could in my my hand. I grasped eighteen. I had twelve with good heads and six with smut. This was in the phosphated portion. I then went into the unphosphated portion and tried it, and got more smut there than in the other portion. I don't know what was the reason of it, but in reaping forty or fifty acres of oats in our neighborhood, I found some badly smutted and others not. This piece of oats yielded forty bushels to the acre, and weighed forty pounds to the bushel. I have used phosphate in corn. I introduced, a year ago, a different process in putting in corn than had been in vogue in our locality. They tell me sometimes, that I am a kind of hobby rider. I went to drilling corn, not for the fodder, but for the corn. If you take and mark out a piece both ways and send a boy along to drop phosphate, a boy to drop corn, and a man to cover it, it will cost too much. I can run the phosphate down two holes in the drill or sometimes three holes, and drill the corn and get over the ground for fifty cents an acre, the priee I charged.

A VOICE. How far apart did you drill those kernels?

Mr. BABCOCK. About six or eight inches apart. I plow my ground in the fall. We put corn principally upon sod ground. We plow it in the fall. The reason of this is, that nature produces her crop at the surface. If you plow just before you want to grow a crop, it is defeating nature. If you plow in the fall, the chemical action of the cold and winter and frost is getting the ground ready. Now in the spring you tell me it is hard. I don't care if it is. I was going to say the harder the better. I use the harrow in fitting that ground. I was induced to use the Thomas smoothing harrow. I use one of those to pulverize the surface. It will do it. The teeth are small and slanting, and cut the soil instead of turning it up in chunks. You drill corn in ground prepared in that way, and I will guarantee that it will grow in the driest weather we saw this fall. I raised a hundred bushels of corn (ears) to the acre a year ago.

I don't know that I can give the reason, but if the ground is plowed in the fall the worms wont bother the corn in the spring. One man, who is a close calculator, says that the money I put in corn paid me the best last year. Where phosphate is put in the hill, you can see in the crop of oats following where the hills were. I have drilled but very little burnt lime upon the soil and some plaster, but my principal experiments have been with phosphates. I have drilled, as I told you, over five hundred acres, nearly all of which has been phosphated in corn, oats, and wheat. I will say this, that I have yet to know of one single instance where phosphate has not paid two dollars to every one invested.

A gentleman asked me this afternoon if our soils could be recuperated without fertilizers. I suppose they can, but it requires time, and we are told that time is money. It took time to destroy and it will take time to bring it back again. If you can put phosphate on your soil and have it the next year, then I say it is better to phosphate. Phosphate can be used after phosphate, and wheat after wheat. I have been told that men can exhaust soil with phosphate. I have never experimented much with salt. In some seed that I bought at the store I got five or six patches of Canada thistles, and so I salted them. I got a ton of agricultural salt intending to use it on my wheat, but did not do it. I put it on my Canada thistles. This spring when the grass was up ankle high, or a little more, I wished to see how those thistles were getting along. The salt did not kill the thistles but it produced a crop of very fine grass, so I cut them off with the sheepshears and applied more salt.

THURSDAY MORNING SESSION.

H. C. GREENE. Mr. President, we have with us a gentleman from Ohio, who is a practical cheese-maker, and whose cheese making practices have been a success, as I know personally. He has practiced and experimented in cheese enough to get pretty nearly on the right plan. He has with him a vat constructed on a new plan and principle. He is now invited to come forward and say what he may wish to say upon his vat and the principles of cheese manufacture.

Mr. T. B. WIRE. Mr. President, being somewhat of an enthusiast, and having a good deal of energy, I have come in contact with a great deal of opposition to my ideas. I had some ideas years ago that I have changed some. This summer I have occasionally visited eight different States in the main dairy district, and have had a better opportunity of noticing the styles of cheese-making, than ever before. I have come to this conclusion, that men making cheese with an acid, so called, have made a hobby in that direction. It makes a firm unyielding cheese. That process I practiced two years. I then dropped into the sweet curd system, and I carried that too far, from the fact that it was almost impossible to draw down a curd and keep it fine enough to get it oxygenized, or deoderized. That was the hard part for me to get over. I adopted the plan of using a larger amount of salt. I think it a success, too. It must have it. Salt is something of a disinfectant. This led me to study on the different ways of accomplishing what I wanted, and that was to make a cheese that would suit my patrons and cultivate a taste for cheese. We tried the curdling process, but it did not work to our satisfaction. I then commenced studying up some kind of machinery for making it. I think there is more leniency in the conventions now. After an article has been introduced and it has been shown that it has merits, there is no difficulty in getting it before an audience of cheese men. Now, to bring my curds down fine and produce an article that would suit the taste of my patrons was what I was after. I never could see the time and money to devote to experiments, and bring it out, until I came to the conclusion that I was going to have the night-mare and die if I did not do something. I made one of these vats and found it worked well. Thirty or forty are at work in the State, and they claim they are making a better cheese and the labor is diminished. I was studying only to get my curd fine, and to do it with less labor. I found there was a current in that vat, the whole mass moving, not one particle remaining quiet, and keeping it fine. You can make lumps, but it is not necessary. Another point is where the chemical change comes in. In the first place it is cut perfectly fine. You may keep heat under it and keep it perfectly fine. Each tooth kicks a little piece back. There are one hundred and eighty teeth, and like a hen scratching they kick it back, and keep it fine. At the time the salt goes upon the curd the curd should be warm. The fact with the old style of vat was that if you drew your curd so hot it was impossible to keep it fine. With this vat you can do that and get your salt upon the curd while it is hot.

A VOICE. Will the whey be expelled from the cold curd as rapidly as from a warm?

Mr. WIRE. The whey will not escape as rapidly, hence the longer you keep it warm the more you are separating the whey. It is not cooking the whey, but it is called a cook, ordinarily a temperature of about (96) ninety-six degrees. I use more salt than most people. The thought is this, and this is what I want to get before you, keep the curd as fine as you can. and get the salt on as soon as you can. Every cheese-maker knows that soon after you have done that, it will change.

H. C. **GREENE.** Prof. Arnold's theory is that the curd should be kept warm until the salt is applied, to facilitate the expulsion of the whey, and, as soon as the salt is applied it contracts and toughens it, thus largely preventing the further escape of whey.

Mr. **WIRE.** Mr. Arnold knows well with the old way he can't keep his curd fine. But I find that this plan is much better, from the fact that you can keep your curd fine all the time after the whey is drawn.

A **VOICE.** If I understand you, your object was to retain more moisture and get a softer cheese than by the old process.

Mr. **WIRE.** That is it. I deoderize, I salt my curd hot, and stir it thoroughly in the air for half an hour, and then if it is not a success I apply more salt. I will say, in regard to stirring the curd, that Mr. Roe, of Madison, and myself, took to the fair a vat, and made cheese there. We found, after we made cheese the first day, that the people who came there were anxious for curd, and were going to eat it all up. We set a boy to selling curd. The next day we made cheese, and sold quite an amount of curd at about fifty cents per pound. The next day we got our curd off earlier and showed our vat, and about one o'clock we commenced selling curd. We stirred that curd all that day. We sold twenty-three or twenty-four dollars' worth of curd. The next day, between eight and nine o'clock, I warmed the curd up and started it going, and sold curd that day. We had two cheese and a half left, weighing thirty pounds each. They went to Mr. Carter's factory. I requested him to keep one of those, I wanted to see it. If you have noticed, curd that has been squeezed out from under the hoops is greasy like, and this curd had become like that. He held one of those cheese till along in the winter, and we examined it.

A **VOICE.** Did you get a good surface to that cheese?

Mr. **WIRE.** Just as nice as you ever saw in your life. It was the softest cheese I ever saw stay in its shape. I toasted that cheese a little on the bottom. I could discover a little bit of a toasted flavor, but every other way was a perfect success. Nobody else noticed that. I believe the time is coming when we will stir our curds longer in the air. Mr. Arnold is in the right direction. If you test it, taking out some curd and putting it to press and hold the rest longer in the atmosphere, keeping it fine and put in more salt, you will see a great difference in the quality of the cheese.

A **VOICE.** How soon will it answer to take it out?

Mr. **WIRE.** My practice is, as soon as you can discover a good degree of firmness by pressing it in your hand.

A **VOICE.** Is not the curing process a development of acid in the curd? If not, what is it?

Mr. **WIRE.** I don't think it is, but I had this test. I was talking to Mr. Ross and he wanted me to make a sweet curd cheese, to compare with his. I brought him down a sweet curd cheese and put it beside the other cheese. He said, that after the third day he believed there must be an acid formed. No cheese could be held that way without it. Mine was perfectly sweet, and he examined and found no acid. The whey was sweet—sweet all the time. I don't wait for acid to develop at all, I run it right along. I draw it right out, and don't wait.

Mr. **BIGGER.** Are you in the habit of examining the whey that runs before it is salted?

Mr. **WIRE.** We test it in the vat, and that will show whether there is acid or not.

A **VOICE.** Mr. Bigger wants to know whether the whey shows acid.

Mr. WIRE. Not a bit. It is perfectly sweet.

Mr. BIGGER. Then I guess you salt sooner than we do. We can't get it without that—the whey is more or less acid. There is not a cheese-maker in this room that can do it. I have observed your vat work. I have seen the curd and the way the whey runs off. There is no way of testing that. I never have seen any but what was more or less sour.

A VOICE. I am an advocate of sweet curd, and yet my experience is, that in ninety-nine cases out of a hundred, the way that curd is oxidized, or when it is ready to salt, the whey is distinctly acid, almost as sharp as mild vinegar. Some hold, notwithstanding, the whey is acid; the curd, the casine, is not acid. That is what Mr. Bigger wants to know.

Mr. BIGGER. I saw from the remarks, that the idea would be conveyed that you were making cheese; that the whey was perfectly sweet. I do not wish our cheese-makers to get the idea that they could make cheese in that way. I think Mr. Wire is mistaken about the condition of that whey.

Mr. WIRE. It occurs very frequently that we have an acid on our whey, and we hurry the process to evade it. We try to keep from the acid, but we often have it sour before we begin to stir it off, but there are other times that I have discovered no acid. When we get our curd ready and salted before dinner, I don't think there is any acid.

A VOICE. Was your attention ever called to ascertain whether there was acid or not when your milk was in that condition? Is it possible, in our ordinary milk, to get such a cheese as you were making five years ago when I visited your factory, and carry it all through perfectly sweet if your milk is in the normal condition, and get a good high-flavored cheese.

Mr. WIRE. I examine my whey very often, and it tells me when an acid is approaching. I don't know when I examined a curd and found it sweet, that I examined it again in the course of five minutes, but I don't believe there is a sign of acid there.

Mr. CURTIS. If Arnold's theory is correct, it is possible to make a fine cheese without developing an acid, because his theory is that the rennet is what does the work, and there is no necessity of bringing on an acid. The mixing in the atmosphere develops what we call a flavor or "cheesy" taste. He holds that the mixing oxygen of the atmosphere with the volatile oils in the milk gives the cheesy flavor, and this is done during the process of curing, and if he is correct it is possible to make cheese without the sign of an acid.

Mr. BIGGER. We are all interested in this. I would not want a false idea to go out on this question. We don't wish to discuss the technical terms I think, on the whole, we pretty much agree on the results.

Mr. CURTIS. I want to say you are right about the kind of cheese, because an acid will develop before you can get the rennet action. If you stop before that you will spoil the cheese. You must have the heat and rennet whether you have the acid or not. At the same time it don't prove that it is impossible to get a cheese without the acid.

Mr. BIGGER. We don't question your theory, but it misleads our cheese-makers. They get off the track, and they think they can salt their curd when the whey is running sweet. But they can't get it mature unless there is more or less acid in the curd.

Mr. CURTIS. Acid or no acid, they must get the rennet action.

Mr. WIRE. Never take any man's theory until you test it. Try it for yourself.

Mr. GREENE. I have drifted out of this acid and no acid discussion, but I rise to say that from the outset Mr. Bigger was after a little game. The game was in a hole, and a root was in the way. He is still hanging on to that root (acid or no acid) that lies between him and the game. There has been a purpose in his mind all the time, and he has accomplished that purpose. I am glad that he has had the pertinacity to stick to the "acid" text. What one man calls acid, another calls digestion and so on. It must refer to a certain state or condition or maturity in the curd, and Mr. Wire's success is in knowing when his curd has arrived at that state. His employés don't know when that time comes, and so they are less successful than he. The cheese-maker's nose is his guide. He smells his curd, and if it is not right, he waits, and while he waits, there may be an acid approaching. We have preached and written and talked on this subject till we think we have an intelligent lot of cheese-makers, and Mr. Bigger need not be alarmed about leaving false impressions on their minds. They will experiment for themselves. I think this question is safe in the hands of our cheese-makers.

SOILING.

By H. C. GREENE.

The subject of soiling, like underdraining, and many other topics, has been recommended to farmers by the agricultural press for many years. There has been no lack of reports of experiments by those who have practiced it, going to show the immense advantages it possesses over the common practice of allowing cattle to obtain their subsistence by grazing over large areas of pasturage.

As is the case with every question of public consequence, involving progress, whether in religion, morals, or economy, it has its ardent supporters who never tire of sounding its praises but are always ready to recommend it to the common farmer, and yet only here and there is a convert made to the system of soiling, and why? The object of this discussion is not to introduce a new idea and urge it upon you. Not, in fact, to urge anything upon you, but, simply, to ask you to answer the question, if you will,—Why have you not adopted the practice of soiling? Some of you may answer, "We have." To what extent? "Oh, we have a dairy of fifteen to twenty-five cows, and plant about one season in three, at least an eigth and sometimes a quarter of an acre of fodder-corn, which we cut and feed to our herd if we have a very dry time and feed gets too short in the pasture." Well, that is soiling to be sure, so far as it goes, and if every farmer would try the experiment, even so far, he would thereby at least admit the fact that his cows were not, in a dry time, making satisfactory returns, and a disposition to do something toward replenishing the pail, for there is no doubt the idea of replenishing the pail takes precedence over that of satisfying the hunger of the cow. But while a few among you practice soiling to this extent, how many of you never do? And why? "The results are not always satisfactory to those of our neighbors who do practice it, and we believe it does not pay."

I will not undertake to argue that it does pay always to feed green corn to milch cows when pasturage is short and dry, although I believe it does, if fed wisely and in sufficient quantities to produce any appreciable effect. But it is proper to inquire, how do you know that it does not pay? You may answer: "We get no sufficient increase of milk." Perhaps not, but why not? Can you tell why you do not? Is it because, by being allowed to shrink for several weeks before receiving extra feed, the lacteal glands have passed out of the condition of full activity and become incapable of excitement by the natural process of food assimilation? There is, no doubt, great difficulty in restoring these organs to their full functions after they have subsided into a state of inaction till inactivity has become a habit—for every class of organs in the physical system is subject to the force of habit. If you were to commence this extra feeding at the first indication of shrinkage, can you testify that you would not thereby derive a profit? Is it not reasonable to suppose that it is easier to prevent shrinkage than to restore from shrinkage? But this matter of extra feeding during a period of drouth, when the little grass cows can find is divested of its juices and milk-producing properties, is not, properly, soiling. It is only soiling a little. Soiling proper means the providing of the various green crops, in their respective times, so as to make an unbroken chain of green fodder from May till November, keeping the herd yarded or stabled throughout the season. As the advocates of the system put it, it is the keeping of a cow on an acre of ground the year round, instead of giving her from four to eight acres to graze on during summer, and feeding the hay from two or three more during the season of snow.

In considering the claims of soiling it will occur to us at once that to practice it we want no waste land, no weak, worn out land, no rough, stumpy, or rocky land. We want just such land as every farmer dreams of enjoying when his time for enjoyment shall have come and he shall find himself snugly settled upon a farm of ten or twenty acres, every inch of which is under the stimulating influence of guano, superphosphate, marl, lime, ashes, stable manure, &c., and all nicely balanced so that what ever crop may be put out, an abundant harvest will be sure to be put in. Such land as we read of when we read "Harry Lewis on Grass," for instance. When you find men soiling to the fullest extent of satisfaction, you find them using land of this sort, land that would be cheap on any man's farm at two hundred dollars per acre. Now he is a desperate poor farmer who has not at least a few acres of this kind of soil. That is, if he has had its management for a term of years, and if he has this soil, he has a place to begin to soil his cows if he wishes to. Why does he not lay off at first, say one acre into long narrow strips, putting one to rye which gets ahead of everything else in spring, one to clover, one to millet, one to oats, one to corn, &c., so as to secure a supply of green food every day, no matter how hot or how dry the seaon may be? The chief reason why he does not do this, is that he foresees it will require forethought, present thought, after thought, and thought all the time, and he is not sure that he will get paid for such a large expenditure of thought. Say what you please about the farmer, I will say that a farmer's thought is his stock in trade and—— he is very careful about throwing his stock around to waste. Make him know and feel that the thought he invests in the soiling business will pay him ten per cent. and he will not be long making an investment. But the great difficulty is to make him feel the force of the fact. We believe a thousand facts that we do not feel, and hence we do not act upon them. You say it involves too much hard work. There is where you don't under stand the farmer's nature at all.

The merchant, the professional man, the banker, the mechanic, all feel the importance of giving their best thought to their business and never slight an opportunity to inform themselves in relation to the latest approved method of conducting it. Is the subject of finance discussed in any paper or convention, every banker studies the arguments carefully. Is there a new and useful tool patented, the wide-a-wake mechanic finds a description of it in his *Scientific American*, and adapts it to his needs Is there a new style of goods coming into demand, the merchant takes time by the forelock, and estimates carefully the number of pieces his trade will take and is prepared to supply his first order on demand. While he may hesitate before taking the shovel or pick to open the drain to his cellar, and show a decided reluctance to manual labor, which he is pleased to call drudgery, watch him and see if he fails to keep a sharp eye to every branch of his own business so as to steer straight for his goal. You will find him at all times eager to invest his thoughts, but rather chary perhaps about investing his muscle. On the other hand you will find the sturdy farmer eager to invest his muscle, but fearful of wasting the energies of his mind by thinking profoundly on the profound and mysterious problems of his own calling.

The farmer cares nothing for hard labor, and the more labor and the less pay the more he smiles. Who but the cheerful farmer would breed his cow to a worthless sire, raise the most unpromising heifer calf and keep her till she has given milk for a dozen years, never reaching three thousand pounds of milk, a year, and yet possess the capacity for a smile.

Let us diverge here just long enough to illustrate the infinite staying qualities of the farmer, who loves to work better than he loves to think.

This fourteen year-old cow has given milk twelve seasons, and the total proceeds have been one hundred pounds of butter a year, twenty-five dollars, and a deacon skin worth fifty cents; this for twelve years amounts to three hundred and six dollars; this is her credit side. She has consumed hay, twenty-eight tons, two hundred and eighty dollars; pasturage eight dollars a year, ninety-six dollars; total debit, three hundred and seventy-six dollars. So the poor old cow has succeeded in running the farmer behind just seventy dollars in cash value. But during all this time she neither milks herself nor churns her own butter. So the labor account stands about like this, (we can only reckon it in time, not in cash value, for it will appear plainly, later on, that the farmer must not undertake to charge his business with his time; it will not bear it:) In securing the twenty-eight tons of hay which sustained life in that cow for fourteen years, the farmer mowed fifty-six acres of meadow, which, at five hours per acre—for I suppose he mowed in the good old-fashioned way—took him two hundred and eighty hours. He carried it to her in six thousand three hundred forkfuls. He cleaned her stable, we will say, (for I do not desire to exaggerate,) twice a week for twenty-five weeks each year, six hundred and ninety times. He drove her to and from pasture two thousand eight hundred and ten times, letting down three bars at each time, a total of eight thousand four hundred and thirty bars let down. He milked her three thousand two hundred and forty times, which, at fifteen minutes each time, took him forty-eight thousand four hundred minutes. By actual count, I find that he squeezed the teat one million six hundred and twenty thousand times. He churned her cream one thousand two hundred and ninety-six times; allowing thirty minutes per churning, he spent thirty-eight thousand eight hundred and eighty minutes churning. He drove to market, ten miles, to dispose of her butter, two hundred and sixteen times, traveling two thousand one hundred and sixty miles and spending eight hundred and sixty-four hours, equal to eighty-six days of ten hours each, on the road. Summing up these time items, we find that thrifty, industrious farmer has spent upon the care of that cow and her products, two hundred and eighteen thousand one hundred and eighty minutes, three thousand six hundred and fifty-six hours. In other words it took him three hundred and sixty-five and one half days of ten hours each to lose him seventy dollars. Many a man can lose money faster than that, and a great deal easier.

While sporting men and oil men strive to see how easily they can lose their money, the frugal farmer works hard for every dollar he loses. I have thus briefly shown up the career of one cow and of one class of farmers, but the farmer who kept that cow for twelve seasons, never dreaming that she was making him money out of pocket, kept several more of the same sort and was thus not doing so small a business after all. He was losing money at a far greater rate than he was aware of. In fact, he has all these years been indulging the hallucination that he was making money on these very cows, all of which goes to show what I was hinting at, namely, that there is a decided disposition among farmers to farm on, work on, plod on, having no definite ideas in regard to the profitableness or unprofitableness of the different branches of their business. They do not know which of their cows are and which are not paying for their keep. They do not know their milk product is shrinking till it has already shrunken. They do not know their pasture is getting short till the cows are suffering of hunger, nor that the water supply is low till their cows are seen sucking up the filthy puddles in the cow-yard. They do not know whether special feeding of cows pays, what to provide for special feeding, nor when nor how to feed it, to secure the greatest profit. Will it pay to buy or grow corn and oats, or wheat bran, or buckwheat bran, small potatoes, turnips, beets, carrots, corn fodder, green oats, millet or clover, to supplement pasturage? Will these, or any of them produce a sufficient increase in milk, butter, or cheese to pay the cost of feeding. If so, which? Poor bony cows often give large yields of milk. Would such cows give more milk, or better, if they were kept in higher condition? These and many other similar questions are to-day as far from definite and conclusive answers as they were twenty or fifty years ago, and why? But because farmers are willing, nay, prefer to drift on, plod on, in the most heedless, thoughtless manner.

It avails little to talk, for talk is known to be cheap. It avails little to think, unless your best thoughts get wrought out in experience. But it does avail to watch your business in all its details, to study the relations of cause and effect, and to remember, and practice on the knowledge thus gained. For myself, I am fully convinced that it does pay to feed cows so well that they wil' work up to their full capacity in milk product. I believe it costs very little to plant, cultivate and feed a patch of drilled corn, and that if properly grown it is profitable to do so, but I believe that if this be fed in connection with wheat bran or shorts, even in small rations, it is more profitable. This I know, that for me, neither horse nor cow is profitable, in which I cannot feel a continual sense of pride and satisfaction. I believe the best cows pay the best, and that every cow pays best when so fed as to do her best.

Discussion.

Mr. A. M. FULLER. I have very little to say upon this subject, and I presume you expect little from me. I might possibly have presented page after page of what is called book farming on soiling. That would be of little value, from the fact that you have had no experience to compare with it. I do not think there is one season in ten that soiling would not be beneficial. The question is what kind of soiling. We want to know more of the relative value of the materials used. I suppose that I have been placed upon this subject in view of the fact that I am chairman of the committee on experimental tests in soiling. I will simply deliver the report of that committee as the basis of future discussion. The committee ask the convention to amend the report in any way they see proper. We think it better that the Association devote a certain fund for making experiments. We considered fertilizers and soiling, and we thought for this year, at least, it would be better to devote it to experiments in soiling. Our report is as follows:

Your committee beg leave to report the following recommendations in the application of the fund set apart for experimental tests in soiling:

1. That the sum of $75, divided into three premiums of $25 each, be offered for the three best papers upon actual experiments in the production and use of crops for soiling.

2. That the sum of $25 be offered as a premium for the best essay on soiling, which shall treat of the comparative value of the various crops that are used for soiling.

The premiums are offered under the following conditions:

It shall be required that the reports be made in writing, setting forth the facts in each case from actual experiments, and that the reports shall be submitted to the Association at the next annual meeting. The reports should state, 1. The amount of ground devoted to the test, the nature of the soil, the quantity of seed used, the cost of the seed, the manner and time of applying it. 2. The size of the dairy, the manner in which the cows are fed and the quantity fed, the result so far as it affects the yield of milk as compared with former years, and with other dairies where soiling is not practiced, the condition of the stock January 1, 1883 as compared with former years, and any other points which will lend additional interest and value to the experiment.

*The premium of $25 for the best essay on soiling, is open to the dairymen and dairy writers of all sections. Judges will be appointed to decide upon the merits of the essay submitted, and the prize essay will be read to the convention of 1883.

A. M. FULLER,
O. O. POTTER,
J. B. PHELPS,
Committee.

MR. PHELPS. For several years I have been practicing soiling more and more every year. I am fully of the belief that people do not soil or feed extra feed during the summer as much as they ought to do. It is one of the great secrets of success in regard to dairying with us. We have talked this up for years past, and last year, as I told you last night, I found my cows gave forty-three hundred and three pounds of milk from April 25 to November 11. You all know that last season was a very bad season from August to October, or from July to October. I had in my factory dairies larger than my own, but through September I furnished one hundred pounds of milk more per day than they did. One reason was better selections, and one great cause was in feed. My neighbors were even with me in milk at a certain time, then in the dry time I got one hundred pounds ahead. There is quite a difference in regard to the price of milk or cheese between May or June and October. I tried the experiment of sowing oats, and feeding them grain. I met with decided success. I got it into my head that oats was better for soiling than corn. I have tried Hungarian grass, and do not like it, for the reason, that it matures too quickly when it is headed out, the next time you look at it, it is ripe and ready to cut. I sowed a piece of oats, a small piece, perhaps, half an acre, after I got through my spring work in June, on purpose to feed. I manured it well,

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*The Association reserves the right to reject any and all reports not regarded as meritorious.

(it was poor ground,) and I got a fair stand of oats. I fed just about four square rods of ground to nineteen cows. I did not keep exact account to see how much I was making, but I made a good profit. But, still, oats is a crop that passes away in a short time. Again, oats are apt to be struck by rust. I claim there is little nutriment in sowed corn fed green. It is too cumbersome for what there is in it. I found better results by drying it. It is a waste of labor chewing that corn, and it don't seem to do the cow any good. I have tried it years and years, but since I have adopted the plan of curing it I have had better results. I would sow my corn any time, whenever I get ready to sow it in the spring. Then cut it up and cure it, and feed it when I get ready.

A VOICE. At what time did you feed the oats?

Mr. PHELPS. Just when they were in the milk, or soon after.

Mr. ———. I don't know that I can say anything in favor of soiling. There is one objection—the country is too new for soiling. There are hardly any of us but have large tracts of land with trees cut down and not cleared off. We have pasture for twenty or thirty cows covered with logs and brush and small trees, which is of no use to us only for pasture, and we mostly pasture our cows upon it. Then it is less trouble. The trouble is, we put on more cows than we have pasture for during the flush of feed in June, and the pastures are eaten down bare when the dry weather comes. You know what the results will be. Let us then keep less cows, so they will not eat all the feed in the flush of the season, and when the dry weather comes, they will have plenty. The cows in the western part of this country live entirely on dead grass, and they will do it here if they have plenty of water. One of my patrons paid out fifty dollars for extra feed, and in comparing with his neighbor, who had more territory and about the same number of cows, there was little difference. He was his fifty dollars out of pocket.

President COLE. I think this question of soiling is not entirely understood. I am not a very strong advocate of soiling exclusively in this country. In this connection the question of fertilizers will come up. The past season was one of extreme drouth, many herds were nearly dried up. If we had had some kind of a green crop, corn, hungarian grass, or clover, we should have realized decidedly better results. Here comes the question of fertilizers. I am not much in favor of feeding green corn. I have tried it. I don't believe it should be fed green. I think it should be cut and at least partially dried. The second crop of red clover comes on very soon. We can mow the first crop when pasture is good, and by the time the pasture becomes short in consequence of drouth, our second crop is budding, and I don't think anything is any better. It stands the drouth better than corn. The past season I saw one or two fields of hungarian grass that looked green, while corn near by was dead in consequence of the drouth.

Be sure that you have something green to feed in time of drouth. In using fertilizers, I don't say what it shall be, but use something that will produce crops in abundance. If it is hungarian grass, and it is likely to get dry, cut it in its proper state, and feed it as you need it. Just so with clover. If it is likely to get too ripe, cut it and cure it. If I wanted to feed it to-morrow I would cut it to-day. I would not feed it green at any time. Last fall my cows were drying up. I put my mowing machine into the field of clover and fed it to the cows night and morning. I would cut down a piece and let it wilt and then cock it up. I found the result was excellent. I kept it up, and another piece I had designed for seed I cut for the cows, and the result was good. The plan is to fertilize, and liberally. If you have barn-yard manure I want nothing better, but I can't get enough of that. By using all we can get we can raise large crops and have a crop of corn, Hungarian grass, or clover, coming right along in the middle of July, and we can keep up the milk.

Mr. PHELPS. I should choose orchard grass instead of clover. I have this reason for doing so. It is just as good for milk purposes, and a great deal more tenacious. I predict that your clover fields next spring the roots will be on the top of the ground, and that will end your clover patch. With orchard grass you may cut it twenty-five times, and leave it perfectly bare, and it is there still. It will stay there while grass will stay. I know because I have tried it. I have a piece of orchard grass that I seeded twelve years ago last spring, and it is in a place where I run over it back and forth, and this time of year when it is wet I have sometimes punched that grass almost out of sight. I get a great crop off it every year. I cut it two or three times a year, and feed to my horses, as I keep them in all the year. I know it will stand, and that is the reason I think it is ahead of clover. It is there whenever you want it.

Mr. WIRE. I don't know that it is exactly on the question, but I would like to give the report of Professor Henry, of Wisconsin, superintendent of the experimental farm. He reported at a convention concerning experiments made. I was disappointed myself. I believed that a good growth of sweet corn would produce more fodder than the other varieties of corn. He experimented with three varieties. The York State corn, the sweet corn, and the southern large corn. We hear of men raising fifty or sixty tons of fodder to the acre. The chances were equal. He weighed his wagon three or four times a day because the mud in the morning stuck to the wagon. He found he had twenty-two tons to the acre of southern large corn, and the others yielded sixteen or seventeen tons to the acre. He said it was his opinion that people need not expect sixty tons of sowed corn to the acre.

Mr. CURTIS, in speaking of the Syracuse salt as a fertilizer, said: There is a distinction between refuse salt and this salt. This is made from the brine just as it is pumped from the wells, without any purification whatever, and contains about two and a half per cent. of potash, and it is considered more valuable for a fertilizer. It contains of common salt 87.74 parts; of chloride of potassium, 2.49 parts; sulphate of lime, 1.68 parts; carbonates of lime and magnesia, .75 parts; oxide of iron, .87 parts; water, 6.38 parts.

Salt that contains two and a half per cent. of chloride of potassium in place of the same amount of chloride of sodium, is worth one dollar a ton more for manure than pure salt. I have not come with the object of advertising this salt, but I will say that it will cost six dollars and sixty cents a ton to put it in down here in Meadville by the car load. The minimum car load is eighty barrels, or twelve tons. The maximum is one one hundred barrels, or fifteen tons.

A VOICE. What would be the effect of the salt on worms?

Mr. CURTIS. It would scarcely affect worms from the amount you use. Your principal benefit comes from the effect on the crop. It makes it grow faster and get out of the reach of the worms sooner. A small quantity of salt put on the corn at the time of planting, will keep the cut-worms off.

A VOICE. I think the best time is just when the corn is coming through the ground. Then the salt will not injure the corn, but it will be distasteful to the worms.

Mr. FARRINGTON. The chairman has spoken of the need of manure on dairy farms. I believe it is a fact stated by chemists that the dairyman may save his manure as judiciously as he pleases, but he can not repair the wastes of the dairy without applying more or less foreign fertilizer in addition to that made on the farm. We are apt to pass these facts by too thoughtlessly. When you read it did you give it careful thought? Chemists tells us that for every gallon of milk we carry off one pound of acid, and for every twenty-five cows a man keeps a year he takes out one ton of bone meal. It is gone. It goes into the butter and cheese products. Hence it is all important that they should be looked at. We have been taught from our earliest infancy that nitrogen came largely from the atmosphere. Now, I believe it is a fact laid down by Prof. Johnson, that in the actual test of fifteen years, wheat being produced, took from the land twenty-four and a quarter pounds of nitrogen, and gave back only eight pounds. A loss of sixteen and one fourth pounds, and you must supply them. We have also been told that a given quantity of straw burnt, and the ashes distributed upon the ground, would produce just as beneficial results as the straw. What we lack in this country is a system of experients. Now, then, it is a fact that the ashes or ash, for in that is comprised all the mineral matter in vegetable production, in the ash from five tons of straw a better result was produced than in ten tons of barn-yard manure. It was because the soil was largely a manure soil, and needed vegetable matter. Take another case and, perhaps, ashes would not be needed at all. I could go on and talk a good while about this; but we have not time. I will only throw out a hint here and there, and it may lead out thought. We want systematic experiments. I want to talk of the waste we are all bearing as farmers. I was raised on a farm, and have owned a farm till within two or three years. I see here a dairy that is producing thirty-five pounds of milk a day, and there another not over eighteen or twenty to the cow. Of course, I am led to ask what causes all this difference? Now, when I come along over a country, and see manures out under the eaves of the barn, and see the black stream of water that is running away from it, I say what colors this? what gives it this appearance? In a ton of barn-yard manure well rotted there are thirty one pounds of salts, all the rest is volatile matter. If you expose that to the atmosphere and waste it, what is the result? It is gone. There may be a number of gentlemen saving the urine matter from their cows in this section of the country. If there are, I have not met them. The liquid excrements are equal to the solid excrements.

A man for some reason or other had occasion to excavate the soil under his barn, and, of course, there was nothing there only the urine that run through the stable floor. He put it on the land. He then went and excavated a trench thirty feet long by five or six feet each way, and cemented it with water-lime, and secured a perfectly tight reservoir to contain the urine. He did it for years. I have seen several instances. His farm was an exception in the neighborhood where he lived. Now, then, this should be saved. It may and ought to be saved. The loss of it is a criminal waste. I don't know that this thing has been brought up in connection with the subject, but the Executive Committee introduced most admirable discussion here, and this is one of the most important points, and should be thought of. We have one gentleman that has sown in two years two hundred tons of phosphate. While farmers are buying this phosphate and paying their money out for it, they have to a large extent a fertilizer that is running away of its own accord, and doing nobody any good. I have noticed it all through the country that it is a sad loss, and I am satisfied that farmers have not taken into consideration its value.

Mr. BABCOCK. The State Secretary of the Ohio Board of Agriculture investigated the value of liquid manures, and found it greater than the solid excrements. Make your stable floors tight, place there absorbents. Raise grain enough to have straw. If you have nothing else bring in the soil out of your best meadow and absorb it.

Mr. PHELPS. I knew of a field of some twenty acres that was poor, barren hemlock land. There was very little soil, the clay in a good many cases, as the saying, is coming up to the third rail of the fence. That field was cleared off, trees had fallen down all over the field. It was cleaned off thoroughly, and manured with the accumulation of thirty or forty cows. It was seeded down, and then we had one of the hardest drouths I ever knew and the grass was killed out. It was plowed again and two thousand bushels of ashes put on that field, and whenever, in shoveling it out and spreading it from the wagon, the ashes did not hit, you could see it just as distinctly as you can in plaster in clover. Five years ago, the last time, I believe, that I saw it, it was just as distinctly perceptible as it had been throughout my boyhood.

AFTERNOON SESSION.

REPORT OF COMMITTEE ON DAIRY UTENSILS.

We beg leave to report as follows:

"Wire's Circular Self-Agitating Cheese Vat" we believe to be a great labor-saving invention, that will, with proper management by the operator, do its work more thoroughly and better than it can be done by hand, and at a less cost, providing the vat is not too expensive. We therefore take great pleasure in recommending it to the careful consideration of all cheese factorymen.

J. M. BIGGER,
D. A. WRIGHT,
Committee.

Wilhelm's Improved Milk-Cooling Can.

This can combines the principles of the submerge and cold air plans of setting milk. The can is similar to those used by creameries, with the addition of an air-tight cover so constructed as to admit of chance for all odors that might be in the milk to escape and be absorbed by the cold water in which the can is set to the depth of milk in the can. It has also an adjustable chamber that can be used for cooling the milk in the center of the can. We can see no reason why this plan of setting milk for cream is not a good one, and is deserving of a trial by dairymen generally.

J. M. BIGGER,
D. A. WRIGHT,
Committee.

Mr. CURTIS. Mr. President and gentlemen, I hold in my hand what is called Heeven's Milk Tester or Pioscope. It is a German invention. It is on a new plan. It is based on the supposition that the amount of fat in milk determines its density. This costs fifty cents, while the other costs ten dollars. I have no more interest in this than any one of you has. As a tester of the kind, it is probably as good as anything you can get, except a chemical analysis of the milk. This plate is divided into six sections. The first one reads "cream," the next "very fat," the next "fat," then the next reads "poor," and the next "very poor." Here in the center is a rubber disk. There is a slight depression in the center there. Now the shade of the milk as seen through the transparent center, will correspond to some of these shades here, (referring to the sections which were of different shades,) which will tell you the quality of the milk. Now I have three samples here given me by the head waiter at the hotel. I told him I wanted some pretty good, some not so good, and some pretty poor. He said he could give me some pretty poor, but would not promise me any very good. I told him if he could give me some as poor as he gave me to drink last night, I would be satisfied. (Putting a few drops of milk from one of the samples into the depression in the center of the pioscope and covering with the disk, the center showed the shade of the section marked "cream.") That indicates "cream." The center is the color of the wording "cream." (Mr. Curtis then tested another sample which proved to be "very poor," after which he added:) This is "very poor," the center corresponding to that wording. Prof. Arnold was quite interested in this. It was invented by a German in Hanover. It is simple and inexpensive. Others cost about ten dollars, and this about fifty cents. They can be obtained through Childs & Jones, Utica, N. Y.

ADVANTAGES OF MIXED FARMING.

By WALTER B. DENNY.

The advantages of mixed farming is a subject which deeply interests every farmer. There is no doubt that mixed farming has many advantages over, and is much surer and much more profitable than any one line of farming, because there is occasionally a year or term of years when some one kind of grain may fail, or so nearly so as to cause serious loss should the whole farm be devoted to its production alone. So with animals. There is occasionally a year, or two or three, when pork is so low that there is no profit in producing it. The same with beef, with horses, with wool, cheese, butter, and all those things produced by the farmer. But if we devote our time to raising as many of the different kinds of animals, grains, grasses, vegetables, &c., as possible each year, we, to a great extent, obviate these losses, or they are at least less felt by us; because when wheat, for instance, is a failure, our corn may be a good crop, our oats yield well, and our potatoes a high price, so that we don't feel the loss of the wheat as much as we should if our whole time, labor, money, and manure had been devoted to that crop exclusively. Therefore I say, gentlemen, it is much safer and better to pursue mixed farming. To be sure if a man raises one particular kind of grain, or a certain breed of stock, and devotes his whole time and attention to it, and studies it, he will certainly excel, and reach a higher excellence, and come nearer perfection in that particular than if his energies were divided, and will prosper while the prices for that product are good. But when an "off year" or two overtakes him, unless he possesses indomitable pluck, he will quickly and despondently add, or take up something else.

Farmers are usually too indifferent as to quality. Always try to sow the best, plant the best, and breed the best, then you may naturally expect the best results. How many of our farmers are driving and working to-day small, inferior-looking, spavined, ring-boned, curby, heavey horses, those which scarcely do enough work in a year to pay their keeping, and they could not sell them if they wished. How and why were these horses produced? They were produced by breeding inferior, unsound mares to *cheap* horses. *Cheap*, because they had no individual merit, because they were low grades; cheap because their blood did not run back through noble, full-blooded ancestors for a hundred years or more, and they are used because they are cheap. Consequently their produce grows up weakly, ungainly, worthless *things*. Then the unfortunate owner says there is no money in raising colts.

Take a *first-class* mare in every respect, near as possible, of whichever of the many breeds you may fancy, whether it be the useful general purpose horse, or the long-striding, graceful roadster, the fiery thoroughbred, the massive, powerful draft horse, or the shetland pony, it matters not which, but have her *good* and *sound* of the kind, then breed her to the best pure-bred horse you can find, no matter if it does cost a little more, if you do have to go a little further to get to him, for it costs no more to raise a good, sound, well made colt, than a poor one. Should the mare be slightly deficient in some point, then be sure to select a sire which is very superior there, for the weak points are always more surely transmitted than the strong ones. How important this is, yet how very few breeders take pains to look after it. And breed to a purpose—decide beforehand what you want, then breed to produce it.

The same with sheep. Which ever breed suits your locality the best or your fancy, or is the most profitable, select it, and use pure-bred sires as nearly as possible, and those which will increase the weight and quality of wool, together with the size of carcass for mutton and form. I believe the English farmer has fully determined that the breed of sheep which gives him the best returns for the food consumed, the sheep that will flock the best and do with the least artificial food, and for the combined production of wool and mutton, is the Shropshire Down. It is what the English tenant farmer calls the rent-paying sheep. While producing a carcass of mutton equal in quality to the Southdown, and a third heavier at the same age, it produces a fleece of medium combing wool which will compare favorably in weight with any of the wool-growing breeds, that is, taking the average weight of a whole flock. They are very prolific, averaging about sixty per cent. of twins, and will suckle twins equally as well as a Merino or Cotswold will take care of one. As a proof of the popularity of this breed of sheep, out of four hundred and sixty-four entries of sheep at the Royal Agricultural Society show of England this year, there were three hundred and sixty-three Shropshire—over two thirds of the entire number exhibited. Some of these sheep have been imported to this country, and seem to do remarkably well, not only in their pure state, but they cross well with our Merinos, Cotswolds, and native sheep.

The hog—where is the farmer that never raised a hog. Wherever you find a farm, large or small, which has upon it any domestic animal, you may be sure the hog is among them. We have a great variety of breeds to select from: the Chester White, the Poland-China, Berkshire, Small Yorkshires, Suffolks, Victorias, Jersey Reds, Durocks, &c., &c. These are all good breeds and pay well upon the farm. The Durock is a new breed, comparatively. They are dark red in color, grow large, and fatten very easily. Some writers claim the white hogs are rapidly disappearing, and will in a few years become extinct; but that can hardly be possible, for he has many friends. A cross of the Berkshire or Poland-China with the Chester White produces a splendid hog, which grows rapidly, large, a good shape, and fattens easily, making a more desirable hog to fatten and butcher than either of these breeds pure. Every farmer should, by all means, keep a few hogs of some of the improved breeds.

But the animal that most interests the gentlemen of this audience is the cow. The queenly cow. The noble eagle is the emblem of our country. Josh Billings says the mule *should* be. *I* say the cow. We see her peacefully grazing on every hillside and plain, the helper and friend of nearly every family in this broad land. She searches out the sweetest grasses and the choicest bites, and when thoroughly satisfied, seeks some shady nook and lies herself down upon nature's carpet, heaves one deep sigh, droops her ears, closes her eyes, raises her cud, and passes into a semi-conscious state. The scene is striking and impressive. How intensely happy she looks and feels. A man, a dairyman, would stand like a statue with folded arms, and gaze at her for an hour in silent admiration and joy, for he knows that *her* joys are *his* joys, that her contentment is money in his pocket. For the grass she has been gathering is now silently being transformed into milk. But alas! these reveries must be broken. The whistle of the cow-boy and the sharp yelp of the collie, announce to her that 'tis evening. She is driven to the barn, relieved of her milk, and returned to the pastures to go through the same routine again. The milk is rattled away to the factory, is converted into cheese or butter, and returns to the dairyman's pocket in the shape of money. The cow is a milk machine—the more you feed her the more milk she gives. First *breed* for milk then *feed* for milk. It is as necessary to breed for it as it is to breed for the fine trotting action for a roadster. The Holstein cows, so noted for giving large quantities of milk, have been bred up to their high standard, by carefully saving heifers from the best milking cows, for generations, and breeding them to milking families. We have cows of this breed in this country which have given over eighty-five pounds of milk a day. Not only the food of the dairy should be looked after, but the water also. The part it plays in the economy of life, seems not to be understood, or at least not to be fully appreciated by some farmers otherwise well informed, as we judge from the little pains they take in supplying it to their stock. The office which water serves in the purposes of the animal economy are numerous and important. This must be apparent, from the fact that fully three quarters of the bodies of all our cows consist of water. There is not a tissue or part of the body, solid or liquid, of which water does not form a component part. All the secretions and excretions are carried on through the instrumentality of water. But for the water in saliva we could not swallow our food, and it is equally necessary for digestion, because it is essential to the solution of all nutrient matter. It acts as a common carrier for conveying the digested food from one part of the body to another, and for carrying off and discharging the effete matter and waste of the system.

It is also essential for equalizing the temperature of the different parts of the body, which it does through the circulation of the blood. In short, all the functions of the body are carried on through the agency of water. There is nothing which more effectually impairs the secretion of milk, than a lack of water. Therefore supply your cows with plenty of good, pure water, then they will give you good, pure, wholesome milk, which will not only make good cheese and butter, but good food to drink. We have no single article of food more perfect in its composition as a food than milk. It contains all the necessary matters, and in just the right proportions, to support animal life. This cannot, in truth, be said of much of our food. Most of it is, in some respects, imperfect. There is a profit and a pleasure in raising and caring for some of each of these animals upon the farm. The poor ones of each kind should each year be weeded out and disposed of, and only the best kept.

The value of the annual products of the dairy of the United States may be summed up as follows: The butter product, two hundred millions of dollars: milk sold, sixty-six millions; cheese thirty millions; calves and pigs grown upon the skim milk and whey, ten millions. The milk used by the producer has been estimated by a good judge to be of greater value than the whole make of butter. The quantity thus used is not quite equal to that used for butter, but it is turned to much better account than milk disposed of in any other way, and hence the high estimate of its value.

It may, at least, be considered of sufficient value to raise the total value of dairy products in the country up to five hundred millions of dollars. This would be equal to, counting for consumption in families, seven hundred and seventy-six million gallons, at twenty-five cents a gallon.

In comparing the dairy with other industries, it compares very evenly with the production of wheat, which, by the Agricultural Department, was estimated, for 1880, at five hundred and one millions bushels, but is less than the corn crop which, for the same year was estimated at one billion five hundred and thirty-seven millions bushels. It is greater than any other single cereal, but amounts to only about one sixth of their aggregate. Like the grass crop, so much of its products are consumed by the producers, that the amount which enters into commercial transactions is not so great as some other industries having a less total value, and hence it does not rank so high in commercial importance.

We have now about twelve million five hundred thousand cows in the United States and Territories. Of this number from ten millions to eleven millions are devoted to the dairy. What a flood of milk. Why shouldn't this land flow with "milk and honey"—if we *only* had the *honey.* The value of land employed for the support of a dairy cow for a year, may be reckoned at one hundred dollars, and considered a low estimate. In many places it will be double that sum, and in others it will fall below, but it would not be safe to place it higher than the figure named, but at this low rate it will require an investment in real estate of a billion of dollars on account of the dairy interests of this country.

In 1870, there was invested in cheese factories about four millions. The number of cheese factories, butter factories, and creameries in the United States is now fully double the number of cheese factories alone in 1870, and ten millions may be set down as the capital employed in establishing and working them. The ten millions of cows directly employed in the dairy, may be fairly estimated at three hundred millions. The teams, and tools, and extra buildings on their account, will equal half the value of the cows kept, and the dairy apparatus ten to fifteen per cent. of their value, making altogether about five hundred millions, besides the investment in land, so that we may reasonably place the investments for dairy purposes at a billion and a half of dollars, without reckoning anything for young stock and breeding animals to keep the dairy in operation and recruited. These figures are already enormous, but, gentlemen, we must keep on increasing, enlarging, and improving, until our golden cheese and butter shall have formed a cow-lactic band around the world, and the figures which represent the business will daze the brain of the accountant, and petrify the understanding of the reckoner.

BREEDING DAIRY STOCK.

By T. D. CURTIS.

One of the principal topics of discussion at dairy conventions, this winter, has been the breeding of improved dairy stock. No one will attempt to deny that there is need for improvement, nor that all the breeding of the past, as a whole, has been a failure. Why have we met with so much failure and so few successes? We have aimed to breed from our best cows, and have taken great pains in making crosses—especially during the last fifteen or twenty years. But who claims to have made a success in breeding dairy stock? Who has got just the quality of stock that he wants, or has made marked improvements that he can point to with a feeling of satisfaction, if not of pride?

I think the cause of failure lies in three things:

1. The neglect to use bulls of equal merit with the cows that we have bred from, depending on the cow to impart her good qualities to her offspring, regardless of the inferior scrub qualities of the sire.

2. Mongrelizing our stock by injudicious crossing, for fear of the bugaboo raised in ignorant minds about in breeding, thus mixing not only inferior with superior blood, but mixing bloods that antagonize each other—bloods that nature never intended should be mixed, and on which proceeding she has set her seal of disappropriation by giving us inferior animals. Bloods, to mingle successfully, must harmonize. Hence, crossing is not the way to bring such bloods together; and if the crosses are extreme, we get mules that our worth less, if not non-productive.

3. We have not paid enough attention to what the modern scientists call the environment. We have not paid enough attention to feed, shelter, water, cleanliness, ventilation, and general care.

I think these three things are sufficient to account for all our past failures. We have not bred intelligently—at least, not understandingly, but have gone on hap-hazard, by guess-work. The result is, that to-day, in the estimation of the best judges, one third of the cows of the country are kept at a loss, another third barely pays the expenses of its keep, and on the remaining third is made all the profit, after paying for the losses on the first third. Hence, the fact is, that to slaughter the inferior third would actually add to the profits of dairying, while the medium third might be slaughtered without any loss of profit, but with an actual saving of the keep and care of the two thirds slaughtered. In other words, we could save two thirds of all expenses now incurred in keeping dairy stock without, in the least, diminishing the profits of the dairy business. On the contrary, taking out of the market the product from the unprofitable cows—and, as a rule, it is safe to assume that these are the inferior products—would diminish the supply sufficiently to materially advance prices and thereby increase profits. It is of no advantage to the dairyman to have a few more pounds of product to send to market, if the additional quantity has been produced at a loss, or at a cost that equals what he will receive for it. Only that pays him on which there is a clear profit. All the rest is labor thrown away.

One reason why the country contains so many poor cows is the boom in dairying, which has lasted now for twenty years. It has led to the raising and keeping of anything and everything that will give milk, though it be no more than the yield of a goat. Many have rushed into dairying by collecting together the cast off odds and ends of dairies—anything to make a herd, under the impression that there is money in it. And they have continued to breed from these refuse animals, rather degenerating than improving the offspring. In the west, this process of going into dairying is now in full vogue. Every farmer is contemplating his future dairy, if he is not already in possession of a mongrel herd. In the east, we are beginning to pay more attention to the quality of our dairy herds; but we are yet very far from reaching a very high ideal of excellence.

The questions now arise: Can we improve the qualities of our dairy herds? If so, how can we do it?

Plainly, we are not to look at the past for an example. Our knowledge in this direction is all of a negative character. It is full of theories and practices to shun, with but little to imitate. Still, it is not without its value as a guide. It tells us in what direction success does *not* lie. It affords us the frightful example that we are to avoid.

But can we improve the quality of our dairy stock? I think we can. I believe it is possible to make the poorest herd of the future as good as the best now. But, in order to do it, we must observe more of the conditions of success than of failure. We must reverse our past practice.

What are the conditions of success?

1. We must select the best—male and female—and more especially must we select the best male, which is the most difficult thing to do. We can completely re-mold our dairy stock by a judicious selection of males; and without this judicious selection of males we need not hope for any material improvement. Whether we cross, engage in by-breeding, or breed in-and-in, we need not look for success without a proper selection of males. This, of all things, is what we have neglected in the past. We have neglected the desirable qualities in the male, and sought improvement only, or mainly, through the female—a most fatal mistake. The bull is a good deal more than half the herd; and we must not only look to his pedigree, seeing that he is all right on the dam's side and on the sire's side; but must be sure that he has merit in himself, and is a getter of good stock. If, after all our care, he fails in this, we must mercilessly slaughter him at once. "Survival of the fittest," is the only rule that will work here, and must be rigidly carried out. Nor must the bull be too young, nor too old. The same may be said of the dam. Breed dairy stock only from the most vigorous mature animals, and keep those animals so that they will maintain their vigor as long as they are bred from. No matter what the blood, do not breed from an inferior animal on either side, more especially be particular that the sire is superior. He is the fountain-head of improvement or of degeneracy, just as his real merits may be, and the offspring can no more be superior to its parents than the stream can rise above its source, unless it is bred under superior conditions.

2. We must avoid all mongrelizing and breed close and pure, being sure that we never introduce inferior blood through the male. Crossing is a dangerous business, as it is difficult to trace the pedigree of the animal very far on either side, and from one or both you may have inferior blood in a well-formed and promisingly appearing male. Besides, however, good as both the male and female may be, the cross is an experiment, and is as likely to combine all the bad qualities of both sides as all the good qualities. The experience of the past is not such as to inspire confidence in cross-breeding.

What is pure breeding? It is but another term for inbreeding. This inbreeding may be of the closest and most incestuous kind, or it may reach out to bring together the offspring of distant members of the same family, in which case, I believe, it is called by-breeding. But inbreeding or by-breeding, you do not go out of the family. Both parents can trace their pedigree to the same original pair. When pure blood Shorthorns are bred to pure blood Shorthorns, or pure blood Ayrshires are bred to pure blood Ayrshires, there is no going out of the family. It is really or essentially inbreeding. The more incestuous the in-breeding the closer it is, and the more likely to intensify and fix the type. Some of the most successful breeding has been of this kind. But here, as everywhere, there must be a judicious selection and coupling of individuals, for, however true the type, there is an individual difference, and the difference must be so adjusted as to breed up and not breed down. If strong points do not come together, at least the weak points on one side must be offset by a corresponding strong point on the other. This rule holds good in all breeding. No matter how thoroughly bred nor how valuable the breed, there must be a proper selection and coupling of individuals, if improvement is to be secured or degeneracy is to be avoided.

3. Another very important factor in the problem of improvement is the environment. The conditions must be kept at least as good as those under which your breeding animals were begotten and reared, even if your ground is to barely maintained and the offspring as good as the parents. I will not say that if only the same favorable conditions are maintained there will be no improvement, for I believe improvement is a law of nature, and that, if the conditions are not lowered, there will be a gradual improvement in quality. It may be, however, that improvement of conditions is one of nature's methods of improving the quality. Sure, I am, that all breeding will be up or down, and that improved conditions are a great aid to the development of superior qualities. It is safe to keep up the conditions, and I believe it pays. I believe it will be found to pay the dairyman to keep his herd much better than most herds are kept now; that it will pay to give them cleaner, sweeter, better ventilated quarters; to keep up the temperature in winter by artificial heat, instead of by extra feed or by extra draughts on the animal's constitution; that it will pay to feed cows in milk enough to keep them from running down in flesh, and that it will pay to give cows in summer plenty of shade and clean water in convenient and easily accessible places. We are only just beginning to consider these things. The time is coming when brains, aided by science, will breed dairy stock, care for dairy herds, and run the dairies of the country; and when only those who have brains, cultivated and active, will be successful in the dairy, or in any other branch of agriculture. Indeed, only such really are successful now; but the world is tolerant toward the numbskulls and blunderers; it will not always be so.

Has it ever occurred to you that we, with all our importations, have, as yet, no dairy breed adapted to the needs of America; while all we have, save our mongrel "natives," are of foreign origin? Who originated these breeds? How did they originate them? Why have no breeds been originated in America?

Our imported thoroughbreds were originated by inbreeding and judicious selection. Englishmen have been the originators of improved thoroughbreds. They first selected the most desirable animals, and then they closely inbred for twenty, thirty, forty, and fifty years. The results of their breeding are before the world. But, if we judge by their performance at the churn, not one of them has excelled Truman A. Cole, of Solsville, New York, a plain, unpretending American farmer. His American Holderness herd, to which I have before called your attention, yields an annual average of three hundred pounds of fancy butter per cow, two or three heifers always included, and, in addition, each raises a fifty dollar calf. How many other herds are there in the country that can do this? Not that there are not individual cows that can do it; but where are the herds? All who have tried this stock are pleased with it. Yet it is the product of twenty-eight years of the closest inbreeding and the most careful selection of males. It has been ill-naturedly said that Mr. Cole's stock to-day is no better than the cow that he began with. I cannot say how true this is. But, supposing it true, is Mr. Cole entitled to no credit for building up a breed, the cows of which average three hundred pounds of choice butter per annum? Is it not something to establish and perpetuate the desirable qualities of a superior cow? Who has done better or as well?

Now, dropping all jealous questioning, here is a fixed fact—a breed of great excellence as butter makers, that has sprung from a single cow and her bull calf, by twenty-eight years of the closest inbreeding. It has been done by the selection of individual bulls to breed from, and by ordinary common sense care. Is there nothing in this worth considering? Is there no example here worthy of imitation?

ADDRESS BY WILLIAM S. HOSMER.

MR. PRESIDENT, LADIES, AND GENTLEMEN: From the soil we derive our subsistence. Where it is sterile we cannot live. Where it is fertile we prosper. Where it is sterile we do not cultivate the soil. Where it is fertile we settle down and make our homes, unless we do something else than cultivate the soil. To some soils and climates some branches of husbandry are adapted, to others, other branches are better adapted. We don't raise oranges here. In Florida and Louisana they raise oranges, cotton, and sugar cane. In some places they prefer to grow wheat, in others corn; again in others they raise cattle or sheep or horses, just as it pays best or suits the taste or inclination of the farmer. Prof. Willard in his treatise on "Dairy Husbandry," thus describes a good dairy country: "Its characteristics are high, undulating surfaces; numerous springs and streams of never-failing water; a soil retentive of moisture; a sweet and nutritious herbage, that springs up spontaneously and continues to grow with great tenacity; a rather low average temperature; frequent showers, rather than periodical drouths, and sufficient covering of the ground in winter to protect grass roots, so that the herbage may be permanent or enduring."

We have here in north-western Pennsylvania a climate and soil that answers this description, with an abundance of good water—a country, the very picture of what Prof. Willard describes as a good dairy country. My friend, Denny, here, prefers to keep horses, sheep, and cattle, but I prefer to engage chiefly in keeping cows and work at dairying. The difference does not lie so much in the difference of the soil, as in the taste and inclination of the men. I choose to settle down in the regular daily feeding and milking of my cows, and to the care and disposal of my milk. This does not suit him, he can't endure it. I stay at home and look after my cows, he wants to be at liberty to go and see the world. He can see the good and bad points of a horse or a steer, a qualification of which I am deficient. He knows how best to take his customer and to effect a trade with him, which I could never do. He has the tact of handling his horses, steers, and sheep, but I can best handle my cows. He has abundance of good reasons for doing as he does, so I may have for doing as I do. I have an abundance of pasture, meadow for hay. and enough land to till. I have a good herd of cows, arranged with special reference to a winter supply of milk. I have in the city a well-established, successful milk route. If I were keeping a dairy, with the view of making butter and cheese, it would make no difference, it would probably be as well. I have comfortable stables arranged for keeping my cows, and the best approved appliances for milking and handling the milk. My experienee and knowledge of dairying would avail me nothing if I were to abandon the business. The proceeds of the dairy furnish us with a steady and reliable income, which pays well for our attention and labor.

I have, in connection with the dairy farming, other operations which do not strictly belong to dairying. I keep some sheep, raise a few calves to replenish the herd of cows, and raise colts. I grow, wheat, corn, oats, fruit, and other crops on the farm. Thus I am able to appropriate to use land that would be idle or yield me but little, and at the same time improve it; to put at profitable use the rich piles of manure, of which we have a good supply; to have a supply of nutritious feed for teams when at work, for cows to keep up the flow of milk, and to fatten the meat for our use. We have on our table a good supply of nourishing food, which adds to our health and comfort. We have resources for increasing the income of the dairy, which is not unpleasant to have. And last, though not least, I have an active, invigorating work for my mind and body, which makes me wiser, better, and happier, and more useful. To get along without work, to live an idle, listless life is one of the meanest, most contemptible, and miserable conditions any man with a spark of intellect can covet.

Cows are kept and butter and cheese are made in all the States of the Union; but Herkimer county, of the State of New York, alone makes more cheese than all the States south of Pennsylvania and the Ohio; and the States of New York, Pennsylvania, Ohio, Indiana, and Illinois make more than half of the butter made in the United States. From these facts we infer that the great dairy belt of the United States lies here in the North, and the producers of butter and cheese at the North will not have the South to compete with them in these products. The South will sooner become consumers of northern dairy products, and, besides, the North will have the markets of our cities and, to a certain extent, those of Europe to supply. Hence the prospect is good that there will always be a demand for these products at remunerative prices. You will have all the South and West to compete with you in producing the other staple agricultural products. Consequently, dairying must be the most important industrial interest of the farmer within the dairy belt, and he has but little to fear from an over-production of his products. The appearance is that the demand for butter and cheese will always be fair, and will increase with increased production. Not long since England ceased to be an exporter of butter and cheese, and has become a large consumer of foreign dairy products.

What helps the dairy farmer amazingly is that common herbage—grass—inestimable in value, wonderful in its growth and universality, which every where covers the hills and vallies, plains and precipices of the northern States; a beautiful plant, esculant, life-giving. Neither the frost of winter nor the drouths of summer destroy it. It always responds quickly to the warm rays of the sun, and joyfully receives the refreshing showers of summer. It is the first plant to send forth its sweet, tender blade in the spring, and the last to stop growing in the fall. Tramp it, and it is ready to spring up again. Never can you crop it so close as to make it despair of life. Without grass stock raising would be almost impracticable, and all farming interests would languish.

Notwithstanding all the advantages to the dairy farmer of the blessings bountifully destowed on him by a benign Providence; by freedom of competition; by near proximity to market; and from increasing consumption of his products, he should study in every way to make the cost of his productions less, and to furnish to the laboring classes a cheap, nourishing, and palatable article of food. For in our cities, and in the older countries, the problem, how to produce cheap food is what they are anxious to solve; and, also, the farmer wants to meet this demand, as well as to increase the rewards of his labor. What has been done towards solving this problem? Impossible would it be to fully answer this question in such an essay as this; it would require a treatise or two on dairy husbandry by men far more able than I am. Dairy husbandry has elicited study by the best minds, and still the subject is far from being exhausted. New inventions, new theories, new processes are brought into notice, and engage the attention of dairymen, and are closely investigated by them. Thus, progress in dairying is constantly being made, and every dairyman, and farmer, too, who is alive to his interest, is storing up information and introducing it into his business. For their improvement, and to more effectually conduct their business and meet the demands on them, dairymen associate together, as we are, in council; bring their products and inventions to dairy fairs for comparison and exhibition, and to disseminate information about them; learn the best way of managing their farms and dairy stock; seek to improve their herds of cows, by rooting out the poor and by the introduction of better, and learn how best to manage the milk and to manufacture it into butter and cheese.

To improve his condition, to stand the equal among his fellow-men, he will avoid carelessness and extravagance in his business and expenses, and will not indulge in profitless idleness. Though he will be attentive to his dairy interest, he will not make this his exclusive business; but to meet his wants, and to produce milk at the least cost, which should ever be his aim, he will introduce, to some extent, mixed farming with the dairy business, raise grain and feed required for his stock and bread for his family's use.

It should be the study of every dairyman how best to increase and improve the products of the dairy. We have already indicated some of the means by which he can do this; but there is another which I fear is too little thought of by us, and if it enters into our minds too little effort is made to adopt it, and to carry it out to success. I refer to the improvement of our farms by draining. The wet ground on our farms produces an inferior herbage of little value. When pastured by our cows, it does not nourish them, nor produce a fine quality of milk, and the cattle running on them are liable to become more or less diseased. As Professor Willard expresses it: "Foot-rot, bloody murrain, and febrile diseases are not unfrequent, when pastures are wholly or mostly composed of low or wet lands. I have known, " he says," bloody murrain to be so virulent on such lands that they had to be abandoned; but by underdraining the land and returning to pasture, the stock was rendered healthy."

These wet lands never can be cultivated to advantage, and when in our tillable fields they increase the labor of cultivation, and produce little or nothing of value. Whatever deteriorates the value of our crops and robs us of the pay for our labor, in some measure, takes from the products of the dairy and increases the cost of production.

The success of the dairyman, in no small measure, depends upon the method of marketing cheese, and I can truly say, with our honored ex-president A. M. Fuller, that "I appreciate the importance of the subject and my inability to discuss it satisfactorily." I also concur with him when he says that "the best method for the marketing of cheese is a subject above all others, which, at the present time, claims the earnest attention of every salesman, proves the bone of contention in almost every factory, and is perhaps as little understood by dairymen as anything connected with the business. The question is, what course shall we adopt in the selling of cheese?"

In his able discussion of this subject, Mr. Fuller has illustrated how the trade was conducted before the inauguration of the associated system of dairying, upon a credit basis. By which I understand the cheese was bought on credit at a specified price, which was to be paid after the cheese was sold, or at some future time. This differed only from the cash basis in that, on the cash basis the cheese was paid for at the time it was bought. In either plan the buyer of cheese made his purchases and sales on the best terms for himself he could, depending upon the profits of the trade for remuneration.

I understand the commission-plan to be that the goods are sent to the commission merchant without having any specified value placed upon them; he is to sell them at their market value, and after retaining a certain percentage of the proceeds of sale to remunerate him for services and expenses, pays the balance to the shipper or consignor. And if required, he advances on the goods when sent to him a portion of their value in cash.

Not a very objectionable plan when you have confidence in the commission merchant, and when no better plan is devised. It has the merit of being permanently established and available, especially to those who have no large amount of goods to dispose of.

The plan proposed by our worthy ex-president for handling the cheese of this section is: "For forty or more factories to unite in sending a representative, not an agent, to New York;" "enter into a contract with two, or perhaps three responsible houses to handle your property. The rate of commission, in view of the amount of your goods controlled by these houses, should be secured at a reduced rate."

The duties of this representative would be, "To examine the goods upon their arrival, noting to whom consigned, their condition and weights, and ascertain when sold; to advise parties at home of the market condition of consignments, time of sale, &c." This plan involves, in my judgment, the intervention between producer and consumer of too many middlemen, which is the most objectionable feature to be avoided, and which objection holds, also, against the other plans.

It now remains for us to propose a plan which is near akin to another that has also been proposed. That we establish a house in New York, to be managed by an agent appointed by us, for the handling of our cheese. The plan which I take the liberty of introducing to your consideration, with the view of promoting the interest of dairymen, is this: Suppose all the factories of one or more counties, or so many as can be induced to coöperate, unite to sell their cheese and, if you please, their butter, too. They will appoint an agent, or a representative, and send him to New York. He must have a suitable place for doing business. All goods to be consigned to him or the place or house designated by him. He shall receive the goods from the manufacturer, or the same thing from the producer, dispose of them, as far as possible, to the consumer with as little handling as possible; when sold, remit the money to the manufacturer. He will keep back enough to pay expenses. The agent selected should conform to Jefferson's rule, "Honest and capable," or, what is better, to the instruction given by the apostles to the disciples in the early history of the Christian church: "Look ye out among you men of honest report, full of the (dairy) spirit and wisdom, whom we may appoint over this business." This agent will be required to give bonds to secure the money and goods entrusted to him, and to ensure faithful services. There may be necessity of appointing more than one agent, that depending on the amount of business he has to do. Perhaps, in the development of the trade, the dairy association may find it to their advantage to ship their goods to Liverpool or to London, or to some other point, which may require an extra agent. At all events, he will want subordinates, which he should select and be responsible for their acts. Expenses will, of course, be incurred, so there will be in any business. The compensation of the agent may be a salary or a percentage. I would prefer a percentage. I should want the business so arranged that the interest of the agent shall be as near as possible in unison with the producer.

If this system be adopted, you may ask what will become of the dairyman's board of trade. I fancy that, as it now exists, it will become a useless institution. The inducements of those who resort to it for buying and selling will be gone. The speculators will be dispensed with, for the business of this arrangement will be to consign goods direct to the agent in New York, and to receive back from him the value of them in cash. But there will be great need of a dairyman's board of trade, revised on the principle of factory-men and their patrons meeting together to select the agent and supervise his work; to arrange the shipping of their goods; for getting advice of the markets; for hearing the advice, suggestions, and instructions of the agent, and for doing any other incidental work the business will require. For the purpose of advancing money to the patrons and salesmen who would want an advance on their goods previous to sales, a fund should be provided or arrangements made with the banks. This will also require the action of the revised board of trade.

These are the advantages which will attain by this plan: The goods will be sold as direct to consumers as possible, without the intervention of unnecessary middle-men, and thereby save expense which comes mostly out of the producer, consequently the dairy business will be more remunerative. The consumer will often be benefited by obtaining his butter and cheese at reduced rates, as the tendency will be to let the consumer participate with producer in the advantages of the plan, thereby creating between them harmony in place of contention, and the strife and bickerings of trade will be allayed or done away with. There will, undoubtedly, be times when producers will be losers by this plan from realizing less than when sold direct to speculators, but when prices advance they will be gainers in place of the speculators, and when prices go down it is no less just that they should suffer the loss, than it is for them to reap the advantage when prices advance. When this plan is established and dairymen experience its benefits, there will be more satisfaction among them than under the present mode of handling cheese, they will be more interested in acquiring information pertaining to their business, and more desirous to produce fine goods, and finally, under the workings of this plan, it will be easy and natural to comply with the recommendation of our worthy ex-president to "always sell your cheese or move it, when it is in the best condition for market." This plan will require thorough coöperation, and I present it to your earnest consideration, believing in its efficiency, and if it receives your united support I cannot doubt of its success.

SPRING MEETING.

MILLVILLAGE, *April 12, 1882.*

ADDRESS BY JOHN FULLER, PRESIDENT.

We are here to discuss the questions which we shall meet in the coming season. We are here to confer together. This is a conference of farmers and dairymen, in which it is expected that if you have any thought of value to yourself or to anybody else you will feel at liberty to tell it. Under ordinary circumstances I might owe you an apology, but as it is I rather consider it a subject of congratulation to you that I am here without any written address. You, at least, will not be bored by one. I had designed, a week ago, to write out a few thoughts that occurred to me, and I sat down, with pen in hand, and got as far as "Ladies and Gentlemen," when the door bell rang, and I was interrupted by some very pleasant company. The next day I got a dispatch to meet our old friend Hubbell, which took the greater part of last week, and so occupied my time that I have been unable to think of anything since. A written address was out of the question. I had designed to talk a little—as I always like to have my say on such occasions—upon the importance and value of farm experiments, together, probably, with some other matters. It has always appeared to me that the knowledge that farmers and dairymen possess is so largely practical that it is desirable that whatever theories they may have should be of that nature. The proper way to gather useful knowledge is from experience. In fact, what we know that we do no not learn from experience is so little that it is hardly worth knowing. It is a fact that farmers, as a general thing, do not experiment enough. They do not take pains enough to obtain knowledge in this way. The reason is, in many instances, that they are not in a situation to obtain facts in that way. Experiments to be worth anything should be thoroughly made. It should be proven out until it becomes a demonstrated fact, the same as all facts in philosophy are demonstrated. The common farmer has a distate for testing or obtaining knowledge in this way. This branch of knowledge begins to engage the attention of the best minds, the best agriculturists of our country, and the need of some better facilities is felt.

In four States there are experimental farms established. There is one in the State of New York that goes into operation this spring. Pennsylvania has a farm or two in connection with the agricultural college, while Germany, embracing about the same area of territory, has seven. We are sadly deficient in the means of obtaining knowledge in that way. The fault has been largely that the people have never worked up to the importance of it. It seems, when we take a glance at the great importance of the agricultural interest, that there could not be a hesitancy anywhere to afford all the facilities necessary for the advancement of the calling. When we take into consideration that agriculture produces three fourths of all the wealth and exports of this country, it seems as if the Government could not afford to withhold substantial aid in every way to facilitate it. This source of wealth is being exhausted. Go into any of the older districts and converse with the farmer of thirty or forty years' experience, and he will tell you that his farm is not as productive as it was twenty-five years ago. I have dairied for twenty-five years, and, while I have improved my farm, I find to-day that it will carry only three fourths as much stock as it did twenty-five years ago. How long will it be before I will have to abandon farming and go west? My case has many parallel cases, and some are worse off. Many do not carry fifty per cent. of what they carried twenty-five years ago. This is a question that we should look into. It demands our attention. In our scramble for western land we have forgotten that we are exhausting our own land. We are sending off in every car-load of cattle, grain, and cheese the food-producing element of our soil. Our success has been measured only by the dollars and cents in bank. We can no more be considered successes as farmers when drawing from our own resources and exhausting our soils, than if we were drawing from the bank faster than the the deposits were made. It seems to me that we should give these subjects our thought.

THE NEED OF BETTER METHODS IN CURING CHEESE.

By G. W. CARROLL.

In opening the discussion on the above question, let us briefly review the methods now in use.

We notice first, the upper room in the story and a half factory, long rows of cheese are placed on smooth boards, turned and greased every day to keep them from cracking.

Whatever the *necessity* for better *methods*, there is no necessity for cracked cheese, because turning and greasing every day will prevent cracking. A cracked cheese is always a neglected cheese.

The temperature of the above curing-room is just equal to the outside air, except on warm days, in the afternoon, when it is about ten degrees higher.

The Great Creator has made vegetable growth consistent with variable temperature, and scientists tell us that rennet action is a vegetable growth and is not impaired by a change of temperature of about twenty degrees in the cheese vat, and why should a change of temperature in the curing-curing-room be so detrimental, as some have supposed?

But to return to our curing-room, we find that the high temperature in the after-part of the day, may or may not injure the cheese in flavor, yet we are quite certain that it causes an undue shrinkage in the weight and richness, by melting the oil in the cheese, so that it escapes by leaking out on the shelves.

Hence the necessity for a room that will not fry the butter out of the cheese, although it must be admitted that this kind of curing-room beats all others in producing a fine appearing cheese. In order to eliminate the frying process, many factories have come down stairs with their cheese to meet another difficulty, scarcely less formidable, in the shape of mold so rank that it will grow half an inch from morning till night, costing four times as much to keep the cheese looking only tolerably decent. Surely there is a great necessity for some better method than is afforded by these tight moldy curing-room. In central New York there is a curing-room papered, boarded, and battened outside, lathed and plastered on the studding, furrowed out two inches, lathed and plastered again, double floored above and below, with an air space between, and windows double. All this to make an even temperature. The cheese in this room were pronounced, by a certain expert, to be of excellent flavor and quality when he visited it.

There is another curing-room in north-western Pennsylvania not quite nor nearly so well secured from outside heat and cold, and yet, in the month of September, it contained as fine a lot of July cheese, as a certain expert ever set eyes upon.

Now, who believes that the closeness or openness of the above rooms had very much to do with the excellent quality of the cheese they contained.

The cheese-makers who made the cheese don't believe a word of it. They are quite certain that the production of fine cheeses depends more on fine pastures, well watered, clean milk pails and cans, well-aired and well-cooled milk, pure rennet, well areated curds, and judicious salting, than it does on even-tempered curing-rooms. How is it that buyers sometimes try, say the fifteenth day, and think it will not do to go, and operators try the twelfth or thirteenth day, and pronounce it cured. Both days have been under the benign influences of the curing-room, and yet are not equally affected by it. This leads us to begin to suspect that we must not look to the curing-room for the cause of this difference in curing, but if we look in the cheese vat we shall probably find the cause; although the cheese-maker has done his best to make an even lot of cheese, making them all after the same formula, yet they are quite different in curing, as well as in other respects. We might take the hint from this and conclude that if we knew enough, we could so manipulate the curds as to vary the curing of the cheese to suit our own convenience. In making the old-fashioned cheese the whey was drawn sweet and the curds were salted sweet, the salt prevented the curd from souring a long time, and the cheese required about three or four months to cure it, but we now reduce this time to three or four weeks, by allowing the curds to lay in the cheese vat until they begin to sour before the salt is applied. After the cheese is put away in the curing-room this sourness increases to a certain point, then decreases and disappears, when it is fit to eat, and not till then. Now, if curds are salted when only very slightly acid or sour, the sourness will not attain to that degree in the cheese, that they would attain to in the vat, if allowed to lay awhile, without salt. Then if salted when the sourness or acid is at the zenith the cheese will be hard and firm, and long curing, especially if salted four pounds to the one thousand pounds of milk, but if the curds are kept warm and allowed to lay in the vat without salt until the acidity not only attains its zenith, but declines a long way adown the horizon until it is scarcely perceptible, then salted lightly and put to press, the curing process will be so far advanced at the time of going to press that it will be ready for eating in a few days.

Allow me to say, in conclusion, that the amount of salt, and the time of applying it to the curds, will vary the curing of the cheese from ten days to six months; and further, that none but well-cured goods should be put upon the market, otherwise it constipates the eater and loses a customer.

H. W. **CANFIELD** did not agree with all Mr. Carroll said. He thought that a room next to the roof of the factory sometimes cracked well-made cheese. Although cheese kept in a lower room sometimes molds, the flavor is better. The blue mold was an indication of rich cheese. The temperature was an essential element in the curing of cheese.

Mr. **HALL**, in order to keep an even temperature, sprinkles the curing-room with water. His cheese sometimes molds, but never cracks.

Mr. **SHERROD** advocated that there is more cheese damaged in curing than in making. He has in his factory three curing-rooms, one down stairs and two up stairs. One room up stairs is plastered and the other is not. The room that is plastered up stairs is the best.

Mr. **COLE** has an upper room, ceiled and papered, with a space left between the paper and the wall. It his opinion that cheese kept in an upper room are not so liable to mold. He keeps the temperature as nearly uniform as possible—between sixty-five and seventy-two degrees. He thinks the material from which the cheese is made has a great deal to do with its cracking. A man cannot make a fine cheese of poor material any more than a woman can make good bread from bad flour. Dairymen are not particular enough to keep the milk clean. If a hundred pounds of impure milk be put in a vat with six hundred gallons of good milk, the cheese will not be good.

Hon. **HARRIS LEWIS** thought that if the rennet was, as Mr. McCarroll said, a vegetable matter, he would like to know the soil in which it grew. He said Prof. Voelker, England's great professor, declares rennet is vegetable matter; but Prof. Voelker is a large man, and makes great mistakes sometimes. He thought a cow would produce a vegetable calf just as quick as a calf would produce a vegetable rennet. The temperature should be kept even.

Mr. **CURTIS** was of the opinion that the rennet was more of the nature of a ferment than of a vegetable. The temperature should not be above eighty degrees. The time of curing depends mainly upon the amount of rennet used. If you put in rennet enough to cure the cheese in ten days it will rot in the next ten days. If you get too much acid it will crack the cheese. If you allow a draught of air to come in it will check the cheese also.

AFTERNOON SESSION.

The afternoon session was opened with the subject of *Experiments in Soiling*, for which the association, at its meeting in January, resolved to offer premiums. The President called upon Mr. John Cole for his views upon the subject.

Mr. COLE said the experiences of last summer were sufficient to convince all dairymen of this section of the necessity of having something on hand with which to supply the lack of pasturage in a time of protracted drouth. It is essential to the dairy interests of this section that the subject be thoroughly discussed and practically tested. He then read the resolutions passed by the Association, offering some inducements to those who will undertake some experiments in soiling. Following are the resolutions:

1st. That premiums amounting to seventy-five dollars, divided into three premiums of twenty-five dollars each, be offered for the three best papers upon actual experiments in the use of material for soiling.

2d. That the sum of twenty-five dollars be offered as a premium for the best essay on soiling which shall treat of the comparative value of the various materials that are used for soiling. The premiums are offered under the following conditions: It shall be required that the reports be made in writing, setting forth the facts in each case from actual experiments, and that the reports shall be submitted to the Association at the next annual meeting. The reports shall state: (1) The amount of ground devoted to the test, the nature of the soil, the quantity of seed used, the price of the seed, the manner and time of applying it. (2). The size of the dairy, the manner in which the cows are fed and the quantity fed, the result as far as it affects the yield of milk as compared with former years and with other dairies where soiling is not practiced; the condition of the stock January 1, 1883, as compared with former years, and any other points which will lend additional interest and value to the experiment.

The Association reserves the right to reject any or all reports which are not meritorious.

The premium of twenty-five dollars for the best essay on soiling is open to the dairymen or dairy writers of all sections. Judges will be appointed to decide upon the merits of the essays submitted, and the prize essay will be read to the convention of 1883.

A. M. FULLER,
O. O. POTTER,
J. B. PHELPS,
Committee.

Mr. CURTIS suggested that a committee of three be appointed to classify the experiments to be tried, and thus furnish the experimentors a guide upon which to commence operations.

The president subsequently announced the following committee: H. W. Canfield, Harris Lewis, and T. D. Curtis. After the meeting the committee met, and, after discussing the matter, made the following report:

After due deliberation and careful consideration of the matter entrusted to their hands, your committee beg leave to suggest the following line of experiments in soiling, to be tried the coming season, subject to stipulation of the Association's resolution:

1st, with meadow grass, green.
2d, with meadow grass, dried.
3d, with fodder corn, green.
4th, with fodder corn, dried.
5th, with oats, green.

6th, with oats, dried.
7th, with millet, green.
8th, with millet, dried.
Time of cutting and condition of crop to be noted.

H. W. CANFIELD,
HARRIS LEWIS,
T. D. CURTIS,
Committee.

IMPROVEMENT OF DAIRY STOCK.

By HON. HARRIS LEWIS, *of Herkimer county, New York.*

This subject before us, that of the "Improvement of Dairy Stock," is quite an interesting one, as well as the one we have just dropped. I had become so absorbed in the last question that I had forgotten my position. I will present the subject as well as I can and bear your criticisms afterwards. I think that the dairymen of this State and ours, and everywhere, lose more money by keeping and feeding and milking poor dairy stock—the class that fail to pay the expense of their keeping—than they do from any other cause. They lose this money, I almost had a mind to say, willingly, satisfactorily. It reminds me of an expression a neighbor made to me. He is a man that has very poor health. One day last week I saw him and I said: "William, how are you getting along?" "Well," said he, "I enjoy very poor health," I told him if he could only enjoy it he was doing first-rate. Those dairymen who can enjoy the loss they sustain, I congratulate. I feel good in your happiness, but I don't believe it is wise, nevertheless. The scourge of abortion in our county has been fearful, but, gentlemen, we have lost more money by keeping cows that fail to pay their way than we have by abortion and sickness and failure from old age. This assertion may be astonishing. I will make another. One third of all the cows in the county of Herkimer, the great pioneer county in the cheese industry of America, fail to pay their keeping. They fail in more ways than one; and we go on, from year to year, and pocket the loss, and seem to enjoy it as my neighbor enjoyed his bad health; for we continue right on. It troubles nobody, makes no uneasiness. Let one Herkimer county dairyman lose ten dollars in a horse trade and he would not forget the horse-jockey in a year; but he keeps dairy cows at a loss of twenty dollars, perhaps, in a year, and it gives him no anxiety, no trouble. Now there are three ways to improve our dairy stock. The first by better feeding and care; second, by selections in purchases.

The third and most certain is by breeding. It is very difficult to improve our dairy stock by selections in purchase, for if a man has a cow to sell it is an indifferent cow, and he places her on the market because he knows her. She may have an uncomfortable way of bringing her right hind foot around toward the milker. She may know where pastures green can be found on the other side of the fence. She may be vicious, and he will part with her. But go to a man who has a choice cow and he is reluctant to part with her. She belongs to his wife, or it is Johnny's cow, and he can't sell her, so that purchasing from these merchants with the view of improving the dairy is almost out of the question.

Now, we will consider the improvement by feeding. Our own cows, we call them our native cows in York State. if they are of any particular breed, that breed is unknown, but we think they are the descendants of all the best breeds of stock known in Europe in the early times, because the immigrants brought over their best cows, for the poorest cows would not pay the Atlantic passage over. The best were brought here, and crossed and re-crossed until we have a mixed breed of cows, many of which are good, but the majority are poor, and the majority fail to pay their keeping. A part of them fail from constitutional weakness. A part fail from indolence and physical debility. Indolence, I say. I can go into any man's pasture at noon on a hot day and pick out his best cow. And how? I shall find her working hard to get an honest living, and the others lying quietly in the shade. This rule holds good in your county as well as in ours. A large part of our cows, from constitutional weakness or physical disinclination, do not consume sufficient food. Another great difficulty is that the best, the most industrious, do not all get sufficient food. If you would feed your cows all the good, nutritious, milk-producing food they would consume, you would be astonished that some of these almost worthless scrubs would double their value at once, and I advise every one of you to try this system of improvement. Provide all your cows with all the good, succulent, milk-producing food they will consume, and mark the result, and then if you have any cows that will not pay their keeping, give them to your mother-in-law. Or if you have a quarrel with your brother-in-law tell him that you will call it square, and give him a cow. Get rid of them in some way. It may not be like heaping coals of fire on an enemy's head, but it would be giving a man, against whom you have a grudge, something that would make you and him even.

The ordinary cow requires per day about two per cent. of her own weight of good nutritious hay, or its equivalent, to maintain life. Now suppose you give her one per cent., after awhile she will starve to death. She will kick the bucket, and go the way of all the earth. But you give her just two per cent. and say that is just sufficient to maintain her existence, and secure to you the fact that you are the owner of a cow, and she won't give a drop of milk. She will do nothing, only eat this ration you prepare for her support.

You may take a pig and ascertain just how much that pig requires to keep up his existence, so that he will not gain or lose an ounce. You can keep him just so the whole year, and he will squeal all the time for more, but will not gain or lose. This is true of the cow.

A great many dairymen, in order to gratify the ambition of keeping thirty or forty cows, will put too many on their pasture. Suppose I have a pasture that will feed ten cows, that will give them all the food they require without much exertion on their part—for the dairy cow has the least physical power, the least physical force of any domestic animal in proportion to weight—so that long journeys for food tell upon her product. Suppose I have just pasture enough to maintain ten cows well, and I put on twelve, what is the result? The twelve cows will give less milk than ten would. I hope every man here sees that. They will not give as much as the ten, and you may take out the best two. Suppose you put on fourteen. They will not produce as much as eight. Put on sixteen, and they will not produce as much as four.

Be careful in stocking your pastures; and remember that the cow produces only in proportion to what she consumes, and unless you give her sufficient food, you cannot expect the best results. Most dairymen overstock, and they are buying cows now in our county, at an average price of about fifty dollars per head, to put on pastures that are now overstocked.

The result is a lessened yield. They better go with what they have than to buy more. Suppose you have a cow that will consume one pound more than is necessary for her support. We will say the cow weighs a thousand pounds, and her feed twenty pounds; suppose she consumes twenty-one pounds. By feeding twenty-one pounds you get a profit on one pound. Suppose she is physically strong and active and healthy, and she will consume forty pounds per day. You feed her forty pounds and you feed twenty pounds to support the cow and twenty from which you make a profit. If you feed twenty-one pounds, you feed twenty to get a profit on one, but if you feed forty, you feed twenty to get a profit on twenty. Always supply your cows with abundance of food. Try this in your first improvement in your dairy stock, and then if you have a cow in your herd that will not consume food enough to render you a profit, turn her off by all means. Turn her off as soon as you can.

Another way is to treat them with uniform kindness. The law of kindness is the strongest statute we have. It is stronger than bars of brass or bands of steel. You treat the cow, or any other animal, with kindness, and their return is greater, much greater, than if treated unkindly. The dairy cow has more required of her than any other domestic animal we have. From her first impregnation until the day of her death she is constantly producing milk or offspring, or both at the same time. There is no other animal of which we require this, consequently she needs the kindest care and most careful attention. All her wants should be anticipated and her desires gratified; and any man who misuses the cow is unfit to own one. The man who treats the cow with brutality is unfit to be the husband of any wife or the father of any child.

In addition to all the food the cow may desire, supply her with abundance of good, pure water. This is essential, and it will lessen the necessity of adding water to the can before it goes to the factory. Let the cow do the mixing, and she will put in just eighty-seven per cent. of water in your milk, and if you feed her right she will never put in more or less, and that is enough. Another thing you can do is to furnish her with salt. That is essential to her well-being, to her happiness, to her highest usefulness. Have it convenient, so she may always get it. I forgot that my friend Curtis is here to sell salt. Give your cow enough salt to save her, anyway. She will never take more or eat less than she wants.

The next is improvement by breeding. Now, gentlemen, you all know your farms here, whether they are rough, broken, hilly, or level. If your farms are level put on the larger breeds of cows. You get more from them on level grounds and rich pastures. If your lands are steep put on the lighter breeds. Put on a cow as strong physically and as active as the Devon for butter and the Jersey or Ayrshire for cheese. Select the cow suited to your farms and to your business. If you are making cheese you do not want the Jersey nor the Devon; but you want some cow that will produce more milk and cheese and less butter, because it will not do to make cheese as rich as we used to do. People are buying and making skim-milk cheese.

Hence, the Holstein, on level land, is a good butter cow, and so is the Ayrshire. After fixing in your mind your type, take your herd that you have now, after weeding out the poor and weak ones, take your present herd, and get your male suited to your notion and locality and farm. If you are in this branch of the dairy business get this male, if in the other get the other, the one suited to your business and your farm. The male in making the improvement is just one half the herd, and will any one say he can't afford to have a good one? I say when you fix your type you can't afford to have any other than the best that money will buy. Breed to suit your farm and the special branch of the dairy business in which you are engaged, and you will make no mistake.

Rear your calves from the strongest constitutioned cows, and if you get a male that is a fixed type the improvement is certain, and not slow and not expensive. We have some breeds so firmly fixed that they might be called a race. Take the Devon; that has been so thoroughly bred that it transmits its characteristics to all its offspring. They have been bred so thoroughly and so long that they have become almost a race instead of a breed. Take the Berkshire pig. It has just so much white on the face and forelegs, and just so much on the tip end of its tail, and just one curl and a half to its tail. So you can see what careful breeding will do, and how easy it is to get a breed suited to your wants. I am not a believer in establishing new breeds. It is not feasible here. Let a man start in this way here; let the best dairyman in Crawford county start a breed. He may have a son to whom he can transmit his farm.

The son, by the time his father is covered in the grave, may take Horace Greely's advice and go west. He may sell out, and the attempt of his father is gone forever. But not so where all these breeds have been established. The English Lord could breed his cows in accordance with the requirements of his farm, and we can see it in all the English breeds. The father starting a breed in any direction would transmit all his real estate to his oldest son, and then to his son's son, down to the last generation: but his direction to the establishing of any breed he attempted made it obligatory upon his sons and son's son to pursue the course he had adopted. Not so here. And while I am glad that the law of primogeniture sunk in the Atlantic passage, I am sorry that we are so feeble and unreliable. I have barely opened this subject for your consideration. We have a good many here who are able to discuss it. Let me again impress the importance of keeping no more than you keep well. This is the first essential to success, and by doing this you can easily select the non-paying from those which do pay a profit. Then, if you select that male that is so thoroughly bred that he will transmit his own peculiar properties to his descendants, your improvement is certain. It is not expensive; it is not difficult.

PARTIAL SOILING.

I have practiced partial soiling a good deal, such as is contemplated by this action of the Pennsylvania State Dairymen's Association. I found it safe to be prepared for a season like last season, for we know not when they are to visit us. We are subject to terrible drouths, and I think that man is unwise who relies only on pasture grass. He better feed his winter store than to compel his cows to rely upon the scanty pickings that most cows had last season. It has been my practice, whenever the quantity of milk given indicated that the feed was insufficient, to feed the cow additional. If I had my winter's hay up, I fed that, if I had nothing else to feed; but my practice has been to have some early mixed grasses, in a part of my meadows, that I cut the last of May or the first of June, and have a good crop before I need to supplement the pasture feed. This I cut and cure, and put in the barn convenient to feed, and I feed it with clock-like regularity, so that the cows go away happy and contented. I find in my experience that grass is the most valuable feed. Some of you may prefer corn. It is easily grown, and you grow an immense quantity on an acre; take the green weight, and it is an enormous quantity, but mixed meadow grasses will produce the most milk and the most flesh and the most butter and cheese. I throw out these remarks that some experimenters may take grass instead of corn.

Corn is better than nothing. It is better than a hard wood rail fence. It is better for cows than a stone wall is. But corn is nowhere when compared with the mixed meadow grasses. I have one meadow from which I have taken forty-eight crops in twenty-four years, and it is set with the common grasses. It has been top-dressed occasionally, as often as I considered it necessary, and this has brought in all the grasses that will grow upon that soil.

I cut rather early, before it gets into bloom, and put it away. I have always been able to get a second crop and use it, if required for soiling, in connection with pasturage. There is no worse policy than to allow the cows to go from day to day with scanty feed. I never could see any money in it. If the cows are put upon a scanty allowance, it affects the pocket directly, not indirectly. The milk is less in quality and quantity; the cows loose in flesh, and no dairy should be permitted to fall away at the approach of winter. So, I would urge upon you to go into these experiments; every one of you try and try for the premiums offered. It is liberal, it is generous, it is wise in the association to offer these premiums; and it will be equally wise for you to accept them and work like men to get them, and it would be very foolish if you did not make the attempt.

I have tried corn five seasons. When I commenced the dairy business, forty years this spring, everybody in the business before me advised me to sow corn to feed the cows in the fall and summer. I sowed corn, but I sowed the large western variety broadcast; it was thick, so that when it grew up the light was excluded from it. It grew yellow, and I did not get good results from feeding it. I will relate a little instance that occurred. After I had fed three or four times as much as my cows would eat I had occasion to go overhead where I kept the hay, and, in going up a lock of hay, was displaced and dropped down. The cows had eaten all they would eat, but they reached for that hay, as a hungry dog would reach for a piece of meat. Taking the hint, I sent my man up and had him throw down a feeding of hay, and they ate it with the greatest relish. I afterwards found they would take the dry oats straw in the same way, and I thought they were using the dry hay and straw just as a woman would use a mop when she puts water on the floor. She uses the mop to take up the water.

I went out and cut up a hundred pounds of this corn in convenient lengths and dried it in the sun; and, after drying it, I baked it, and weighed it. Guess how much the hundred pounds weighed when I had the water out. Mr. President, I had just eight pounds left. I dried out ninety-two per cent. of water from this splendid (?) cattle feed.

Mr. CURTIS. How much nutriment was left?

Mr. LEWIS. Well take the silica and pith out and I have no idea how much was left; precious little I think. Ever since that time I have dried corn when I fed it. Taking a pleasant day, three or four days before the corn was wanted, I cut it and dried it.

I find that clover is a much better soiling crop, when partially dried, than when green. But of all the plants I have used so far—and I have used the millet, corn peas, oats, and our common meadow grass,—of all the soiling plants, the meadow grasses, with a little clover mixed in, dried, is superior to all others I have tried.

Mr. CURTIS. I have had no experience, but I heartily agree with what Mr. Lewis has said about this corn overgrowing. I consider it worthless. If any of you do attempt to soil with corn, drill it in rows three feet apart and not more than three or four or five stocks to the foot, or plant it in hills. Cultivate it and let the sun and air get in to mature the corn. Don't use it before it blossoms; there is nothing of it before it blossoms. Then it stores up the gums and sugar and you have something.

President **FULLER.** My own experience entirely concurs with that view of the matter. I have fed it more or less for twenty years, and when I feed it now I plant it three feet apart one way, and in hills, about eighteen inches apart the other way, with four, five, or six kernels in a hill. I let it be till it is ready to glaze, then I cut it and dry it. I only feed it in that way.

IRA HALL. What variety of corn is the best?

Mr. **LEWIS.** There is no doubt that some of our varieties of the sweet corn are better than the ordinary corn. I think your State corn and ours is better than the western corn.

Mr. **CURTIS.** Do you have any trouble in getting good seed for sweet corn?

Mr. **LEWIS.** I do.

Mr. **HALL.** Sweet corn is the best I have used. I have my own seed generally. I have two or three bushels now that is good. Last season was an extra season to save corn.

Mr. **CURTIS.** Tell us how you save it.

Mr. **HALL.** I cut my corn and pull off the best ears and string them up in the barn and let it dry. I put it where it won't freeze when the cold weather comes.

Mr. **CURTIS.** I think the seed don't get sufficiently dry before the cold weather comes on, and if you put it in a dry place where it don't freeze there is no trouble.

HIGHWAY REPAIRS.

By Mr. A. M. FULLER, *of Meadville.*

I have selected as the subject of my address a topic which I trust will not seem foreign to the purposes of this organization.

We are all interested in the improvement of highways, and I believe that the subject of highway improvement is deserving of our thoughtful attention, and especially in view of the wastefulness and extravagance of our present system of road construction and repair.

The highways are in a certain sense public property, and we can say as we drive from village to village that each one of us is joint owner in all the roadways.

In this section we build only pleasant weather roads.

It would be difficult, indeed, to estimate correctly the damage which has been sustained the past winter, owing to the impassable condition of the roads. This is largely attributed to their faulty construction, or, perhaps, in many cases to their utter neglect.

Good roads are the first of all conveniences and necessities, yet we are in nothing so deficient as in good roads. Our charming villages are united by mud drives nearly impassable one half of the year, and during the remaining half a reproach to the enterprise, wealth, and thrift of the inhabitants.

It is not until recent years that even the towns have made much progress in the direction of good driveways. The towns and the country alike have in many cases to learn that sand and loam alone will not make a good road, and that in the end the truest economy is practiced by devoting the money expended on streets and roadways, in work of a substantial and permanent character.

In the larger towns the burden of taxation is so greatly felt that an improvement which is not deemed imperative is generally looked upon as almost unnecessary. In every community you will find those who are "upon principle" opposed to improvements, and hence any expenditure looking towards public improvement, however necessary, enlists their earnest opposition. It requires time, and frequently much effort, to convince the average citizen that the good old ways are not always the best ways.

In the country districts the methods of our forefathers are still pursued by the sons, the present generation seemingly entirely forgetful of the difficulties under which their pioneer ancestors labored.

Commencing with the unbroken forest through which ran the simple bridle path, the early settlers widened the passage way, and improved it to the best of their ability, leaving to us the task of fully completing the work begun. I would ask, how well has this been done? Has there been any marked improvement in the condition of our country roads during the past twenty years? Some, perhaps, but nothing commensurate with the increased wealth and ability of the present generation.

It is not for increased taxation that I argue, but rather for a more intelligent application of the present tax, and this leads me to a consideration of the defects of our present system of "working out" the road tax. The best roads in America are to be found in the Dominion of Canada. The Canadians have very generally adopted the English system of macadamized roads, and to-day, in the more thickly populated sections, you will scarcely find in road making and repair anything approaching our shiftless and improvident system of dabbling in mud, and the consequent carelessness of construction. We lack a knowledge of the best practices in road building, hence we do our work to little purpose. We require to go back a century or two, as far back, if you please, as the time of the landing of our Pilgrim Fathers at Plymouth Rock, and copy the best methods in vogue on the Continent even at that remote period. Canada copies English custom, and in nothing has she been successful or exhibited better judgment than in adopting the English method of building roads.

Common Defects and How to Remedy Them.

The defects most prominent in our system (if it is worthy of being called a system) of road making is in rounding up the road bed so that teams necessarily pass on the summit and cut the way into ruts and ridges. The first heavy rain produces mud holes and a broken surface. Efforts to escape these only make matters worse, and, as a consequence, the road becomes nearly impassable. Each year the same remedy is applied—a quantity of dirt plowed and scraped from the ditches and ridged upon the driveway. The body of the road thus becomes from six inches to two feet higher in the center than at the sides, and except in the best of weather there is never good driving.

The "pathmaster" is generally a busy farmer, changed annually, and selected with no idea to his fitness. He directs the labors of his neighbors, each one as ignorant as himself of what to do—plows, digs, scrapes until the tax is worked out, and then stops, no matter in what condition the work is left. This is our "system," and it is as bad as it can be. In many cases it would be better to let the road entirely alone. Of course, there are exceptions to this rule, and in some cases the work is done properly and faithfully. It is frequently the case, however, that the pathmaster who is qualified for the position, and tries to do the work well, and, above all, believes in doing a day's work for a day's pay in road tax, is elected by "a large majority"—to stay at home after his first term. The go-as-you-please pathmaster is the man most sought after, and by far the most popular.

Again, the road beds are generally too narrow. The consequence is the same as when too high—ruts are cut into the track. The driveway should not be less than twenty feet in width, with a slight slope or roll. Such a road will not be readily graded at first, but in the end will pay for all the labor expended in its construction. Let the road be well set in gravel or stone, and it will need but slight repair for years. It will be good in all weather, unless it is damaged by unusually heavy loads. The pathmaster's work should then be to see that small breaches are promptly repaired, and the original grade retained. In roads which are but little used a road bed fifteen feet in width will be sufficient.

In building a country road, of course, the first requirement is good drainage. Without this no material will endure. This fact, unfortunately, receives the least consideration under the pathmaster's system. Good, clean gutters, discharging readily into a creek or ravine, should be established. The second requirement is gravel or broken stone placed in the road to a depth of from ten to twelve inches.

There will be but few holes or ruts if the road be of sufficient width and proper inclination and drainage. A road once carefully made in the manner indicated can be easily kept in repair by the present system of annual taxation or labor.

In this connection the question will probably occur to you, is the pathmaster system the best one? I doubt very much if it is. In towns such work as paving is generally let by contract to parties who have had experience in this kind of work, and in all cases of street improvement and repairs a street commissioner superintends the work, and is held responsible for it. This plan is calculated to ensure the best result for the money expended.

If the same method in the expenditure of your road tax was adopted I believe that the tax could be reduced one half if payable in cash—expended under the superintendence of a township commissioner who would be competent to carry out the work, and it would result far better than your present system.

It would be necessary to adopt laws to govern the matter, whereby you would be assured of the faithful performance of the duties devolving upon your commissioner, of the security of the fund in the hands of your supervisor, and to prevent any "leakage" or misappropriation of the road tax fund. If the plan were adopted there would be little difficulty in perfecting the details of it.

I repeat, I believe that you can reduce the road tax one half if made payable in cash and so expended, and accomplish better results than under the present system. I have found very few farmers who would not willingly part with the present system upon these conditions.

In an early day, when everything was paid for by the farmer in labor or produce, it was not practicable; but at the present time I believe that it is not only practicable but advisable.

The average sum of the annual road tax, in cash and labor, levied in each township for roads varies in amounts from one thousand five hundred dollars to four thousand dollars. If we reduce the tax one half, payable in cash, the amount would then be seven hundred and fifty dollars to two thousand dollars.

In the larger towns let the fund be expended in five months of steady work on the roads. Employ a township commissioner, at a salary of say sixty dollars per month; two teams and drivers, at seventy-five dollars per month each; three extra hands at thirty dollars per month each. This would involve an expenditure in five months of one thousand five hundred dollars. The six men and two teams, working steadily for a period of five months, would be equivalent to the employment of forty-two teams and one hundred and twenty-six men for one week. The balance of the road fund would be required for the building of culverts, and to meet the expense of the superintendence of the road during the remainder of the year. I would ask is there anything impracticable about this plan? Would it not result in providing good roads, and be a decided improvement over our present system?

A very important advantage presented by the system I have just named is that improved implements especially adapted for constructing roads could be procured and used to great advantage, whereas, under the present system, the common scraper and indifferent tools add much to the difficulty and expense of constructing and repairing the roads. In small towns and boroughs I would recommend that the cash system be adopted, even if the sum will not suffice to keep a gang of men on the streets for more than one month. Purchase the best tools for road making, and the result will astonish you.

You might as well expect a laborer to accomplish a good day's work with a dull saw in cutting wood as to expect good road work with indifferent and unsuitable tools.

Whether a change in the system is effected or not, it does not materially alter the case. What we are now aiming at more particularly is improvement.

The Value of Crushed Stone in Road-making.

Every town, certainly every prosperous town of eight hundred to one thousand people should own a stone crusher, run by either steam or water. A steam crusher of this sort can be placed permanently in a quarry from which the needed supply of stone is to be procured, or it can be moved to different sections of the town, and used to crush stones gathered by farmers from their fields and drawn by them in part payment of their road tax.

The expense of a crusher is about four hundred dollars to six hundred dollars. It needs two hands to operate it, one of whom may be but an ordinary laborer, whose business is to feed the stone. I know that to many this suggestion will seem visionary, and you will accuse me of being extravagant in my views.

I am aware that at first sight it would appear so. We are so apt to consider only the present and its immediate demands. I will assume that the present system is of little value in furnishing good roads, and I think you will all bear me out in this assertion. Suppose that we adopt the crushed stone system, (of course only in sections where good gravel is not to be had,) and view it in the light of a ten years' experiment. The cost of a crusher is not great, and where the expense is divided among a large number it will scarcely be felt. It then remains to divide the road tax into the delivery of stone, and its carriage to the part of the road to be repaired.

In all towns there are usually short pieces of road which are in a very much worse condition than other portions, and frequently there are not more than three or four such mud holes to be found in several miles of road. Suppose you repair in the manner indicated but one or two of these places annually, and it will not be ten years before at least the main roads will be in a very passable condition, and with proper construction, these extended mud holes to be found in every road will be rendered as good as portions of the road where good drainage and gravelly soil naturally prevail. A mistake is frequently made in supposing that gravel of *any kind* will answer to make a good road. Such is not the case. Gravel obtained from the beds of streams is sedimentary in its nature, and after being in use for a short time crumbles and becomes mud. Where good sharp gravel can be obtained for roads, crushed stone is not necessary.

One load of crushed stone, however, is estimated to be equivalent to four loads of the best gravel for road construction. A stone crusher is capable of crushing about forty loads of stone per day; this is equivalent to one hundred sixty loads of gravel. In sections where good gravel is not to be had, I believe the plan which I have sketched to you is not only practicable, but in the interest of true economy in the expenditure of your road tax fund. The portion of your road tax paid in cash under the present system, will suffice to pay the expense of running the crusher. The stone can be furnished in payment of that portion of the road tax now paid in labor, and it will be no little benefit to the farmer to be able to thus dispose of the field stone which are only an obstruction to tillage. I want to add, that I think it practicable for two or three towns to join in the purchase of a crusher, if the expense is deemed too great for a single town. Or a township and a village of several hundred inhabitants could own a crusher jointly and to advantage.

It should be understood that all labor is thrown away that is not used to construct a road bed thoroughly in every way. If slighted in any particular nothing will result but ruts, mud, and misery.

Stone, gravel, or good road material must be used in an intelligent manner to make them of more value than clay.

The wear of bad roads is estimated to demand from two to five times the amount of horse power required on a reasonably good road. So the farmer really pays in wagon wear and horse wear far more per year than he would if subject to road tax sufficient to secure a first class road bed. It is therefore a matter of economy to improve our highways, and to do it so thoroughly that the work will endure. The chief wear of a farm life is not on the farm, but on the road. Mud and dust are equally destructive to horse, harness, and vehicle.

I should be greatly misunderstood in this matter if it were thought that I desire to introduce the macadam system of road building for our country roads, to the extent of building macadam roads as they are constructed in England and in some parts of our own country. It may be of interest to know how macadam roads are constructed, and a brief explanation of the system will suffice to show that it is only a *partial* adoption of the system which is recommended. In building a thorough macadam road, the roadway is excavated, graded, and properly formed to a depth of from sixteen to eighteen inches from the level of the gutters with a cross-section of the road when finished. It is then thoroughly and repeatedly rolled, all depressions being filled and rolled before the stone is put on. On the bed thus formed and consolidated, a layer of stone eight inches thick is set by hand, and rammed or settled into place by sledge hammers, all irregularities of surface being broken off and the interstices wedged with pieces of stone. The intermediate layer of broken stone of a size not exceeding three inches in diameter, is evenly spread to a depth of four inches and then thoroughly rolled. The surface layer of stone, broken to a size not larger than two and a half inches in diameter is then put on, to the depth of four inches, and thoroughly rolled. Finally, a binding, composed of the screenings, is then applied, well watered, and most thoroughly rolled until the surface becomes firm, compact, and smooth, the superfluous binding material being swept off and removed.

The Roadside, Weeds, and Tree Planting.

It is not my intention, however to limit the discussion of this subject merely to the roads. The road-side claims our attention as well, and is equally deserving of improvement. I am indebted to a discussion of this subject by Mr. E. P. Powell, of New York, for many valuable hints regarding the improvement of roads and highways. Our roads are the nurseries of all the worst weeds that can be found.

Mr. Powell says: "I drove recently by a small place, within a mile of a city of forty thousand inhabitants, and saw a half acre so full of Canada thistles that the farmer had mowed around and left it. It was in full ripeness, and the seed by the million was blowing where it might. This strip reached down to the very driveway. To say that such a man ought to be prosecuted is to say that a good many things ought to be done which will not be done. He has left that half acre for two years as not worth cutting, regardless of the damage done to the public.

"Drive where you will in July and August, and you will rarely go amiss of thistles, docks, burdocks, wild carrot, mallow and mullein, as well as all other weeds of the region, utterly undisturbed. Our noxious weeds are spread chiefly by being allowed to propagate up and down the land in roadways."

In some portions of New York State and the New England States the case is far different. They are not only provided with good roads, but more care is taken of the roadsides, which in most cases are kept comparatively free from unsightly bushes and noxious weeds, adding much to the attractiveness of the drives and denoting thrift and enterprise on the part the people. I think it would be advisible if we could have local combinations of the people in this section to attend to this matter and endeavor, if possible, to render our highways attractive, and less productive of evil to the surrounding land.

Another important element in highway improvement is the planting of trees by the roadside.

In the other portions of the country, and especially in New England, many of the highways are bordered by long lines of trees, which not only add to the beauty of the scenery, but also afford to the traveler grateful shelter from the hot rays of the sun, and in addition to this they exhibit a spirit of enterprise and culture creditable to the people, and certainly in many cases add to the value of the property so improved.

A fine row of shade trees on the sides of a main road leading through a farm enhances the value of the property almost as much, perhaps, as a good road to the leading market adds to its value and desirability.

I am aware of the fact that some farmers object to trees even in the roadway, as detrimental to the land adjoining, but I believe the advantages far outweigh the objections. I would remind you that the laws of our State encourage the planting of trees by the roadside, and that if you so desire, one fourth of your road tax can be applied in this way, and I would add that under our present defective system of road making the expenditure of one fourth of the tax in the planting of trees will certainly result in no detriment to the roads.

I trust this brief presentation of the subject of highway improvement will result in arousing some interest in these matters and be productive of good.

It is not, until recent years, that any but the wealthy have thought it worth while to cultivate flowers in their homes. To-day the humblest cottage in country and town is not without these emblems of beauty and refinement.

Our railroad companies are planting chestnuts and spruces along their tracks, and rendering their lines of travel a continuous and lovely park. Such improvements are suggestive to thousands of travelers who go home to put in practice the hint thus given them on their country roads.

Let us in this section aim to keep up with the times in these respects, and be ambitious to follow in the progress of improvement if we are not bold enough to lead.

The subject of highway improvement is receiving much attention at the present time from the press, and it is to be hoped that ere long the people will take hold of it and put into practice the valuable suggestions which are being offered. We are making rapid progress in the development of industries which have long been controlled by Europe, and bid fair to outrival her in many things, and let me ask, why should we be so far behind in the matter of public improvements? And among all her methods of public work we cannot at least do better than to copy her system of "Rural Highway Improvements."

President FULLER. While we are very ready to admit that there are some defects in our system of road-making, yet is it a fact that we must take such a wide departure from our ordinary methods to suit a fancy dry goods merchant in the city? I hope the members of the convention will take up this subject and discuss it, and if Mr. Fuller is right, give him credit, but if not, go for him with ungloved hands.

Mr. COLE. I heartily acquiesce in the remarks of my friend Fuller in regard to the dairy interests. It is highly necessary that we have good roads on which to take our milk to the factory. And since my friend Fuller succeeded so well in his directions as to road-making—a man who never milked a cow, who never drove a cow to pasture, who never put a cow in the stable, or put one out of the stable—since he succeeded so well I will speak in his favor. Now, I think I can see the point. He may have a little grudge at some of his old friends. The point is right here. The citizens of Meadville got the spirit of enterprise and sent up to Cleveland and got a pepper-mill or coffee-mill to grind up the pebbles on their streets; and they ground away till they got enough to pave a few rods by the market-house. I think my friend Fuller is bit a little. He is fishing to have some of the townships unite themselves with the borough of Meadville in connection with that coffee-mill. That is the main point I want to make. As for his other remarks referring to old England to teach us how to make roads, I dissent from that. I believe there is intelligence enough in the American people to know how and when to make roads. A man that never held a plow, who never took hold of a hoe, who never drove a mowing machine, or anything of the kind, for him to come up here to tell me how to make roads! This thing was introduced some two years ago. Mr. Fuller made a great effort to show the thing up, and found himself in a dilemma. He applied to the artist to help him out of the scrape. He took the artist into the country one hot day in June, where the men were working on the road; the men wanted to stop and take breath. He got the artist to picture the men out and make them look as miserably and lazy as he could. I would not have cared anything about that, but he went and got the photographs of that picture and sent them all over the country, away to California.

Mr. LEWIS. I would inquire if, in the picture of the group where Cole was found, Cole was recognized?

Mr. A. M. FULLER. Mr. President, I shall certainly have to reply to Mr. Cole. We have had differences in the past, some serious, and some not so serious. I have had timely warning of this. Before dinner I was informed that if there was a loop-hole open he would go for me. In regard to holding the plow, driving the mowing-machine, and milking the cow, I have done a little of that, but only a little. As regard the matter of improvement in the streets of Meadville, we are very well satisfied with what has been already done. We will make this season a larger improvement in our streets. We have with us one of the members of the city council, Mr. Anderson and Mr. Magaw. I don't wish to be looked upon, gentlemen, as carricaturing the methods of working out road tax. You know me well enough to know that I am not that kind. In regard to this half-way business, I don't think there is anybody but will admit that this is about the way in which road tax is all worked out. I say, a man is a fool who will pull up his sleeves and do a day's work on the roads, with others, who do in a manner nothing. There are upwards of fifty thousand dollars spent every year in this county on the roads. You should devote you labor and money to s me purpose in this matter. We have changed our system in Meadville, and are satisfied with it. Why can't you change it in the country?

Mr. T. D. COLT. I lived in Union county, Ohio, three years, where most of the roads are graveled roads. There, on the main roads, if two thirds of the taxpayers adjacent to any road, would sign a petition for a gravel road, they could have a gravel road, and the taxpayers paid for it. It cost from one thousand to twenty-two hundred dollars per mile, according to the distance they had to haul the gravel. They are made sixteen inches deep in the center, and twelve inches deep on the sides. I don't know how wide they are. They are nine of these roads leading into the village of Richmond. We always have good roads there in the spring and fall of the year. There is a fine imposed on any man hauling more than fourteen hundred pounds when the roads are soft in the spring. When they repair those roads, they just have to scrape the gravel from the edges up into the center again. I am in favor, if we only have one road, of having that road good.

E. K. RANGE. In Ohio they have a law requiring every man to work out one day's tax. If he is a merchant or retired man or a lazy man, he must hire somebody to do that work. We have not tax enough here to keep up our roads. I must dissent from my friend Fuller, concerning doing only half a day's work, for here we have able-bodied men, and they turn out for a good purpose and they work well. But we have too much road to keep up for the amount of tax levied upon us. We could make a reform in our tax system, by levying twice as much tax. I have thought of getting up a petition and sending it to the Legislature to have a law enacted, requiring every man to work one day's tax, and the rest of the tax the same as we are working.

J. CANFIELD. I agree with Mr. Range in requiring every man to work a day's tax. I think that is required now. I was surprised at Mr. Cole's attitude on this question. There should be a radical change in the manner of applying our road taxes.

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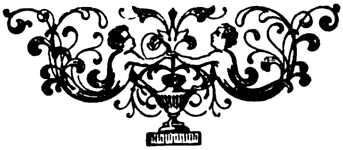
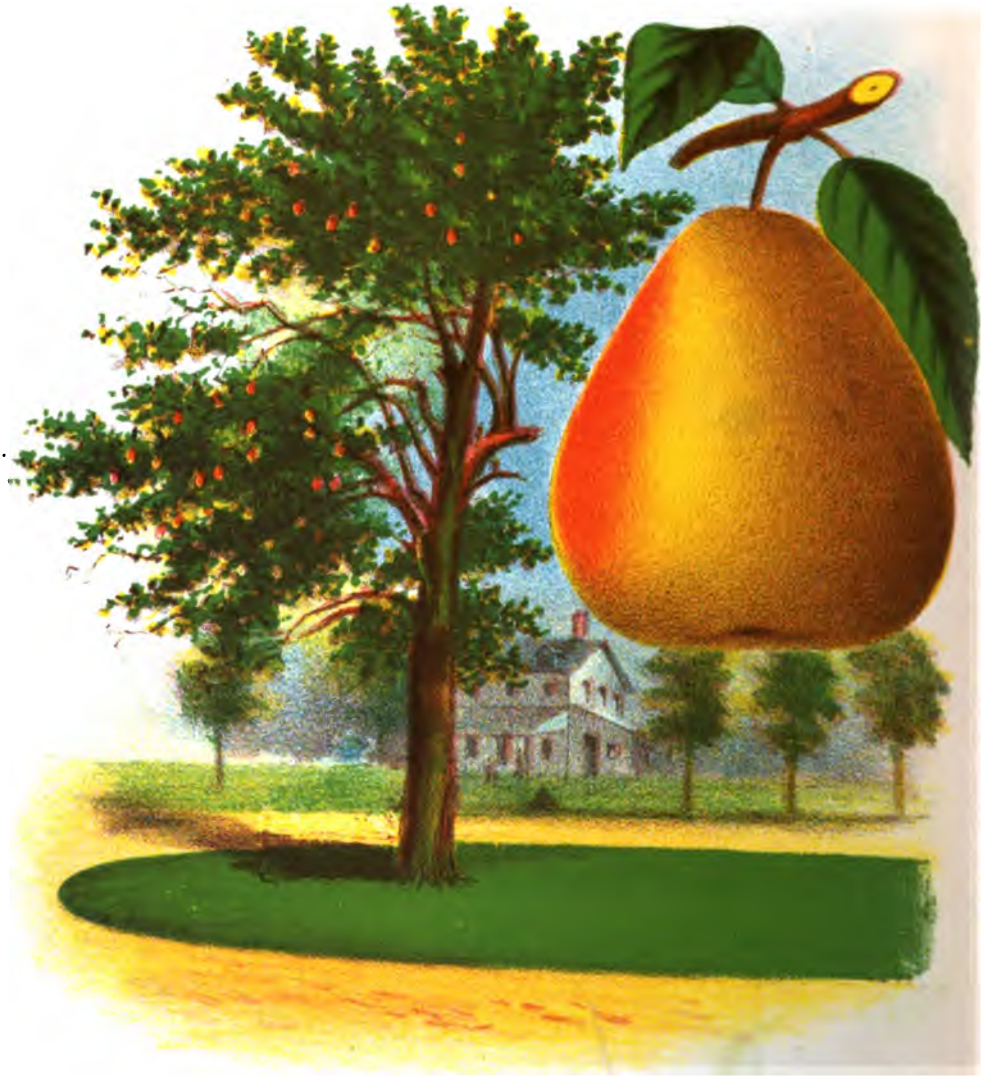
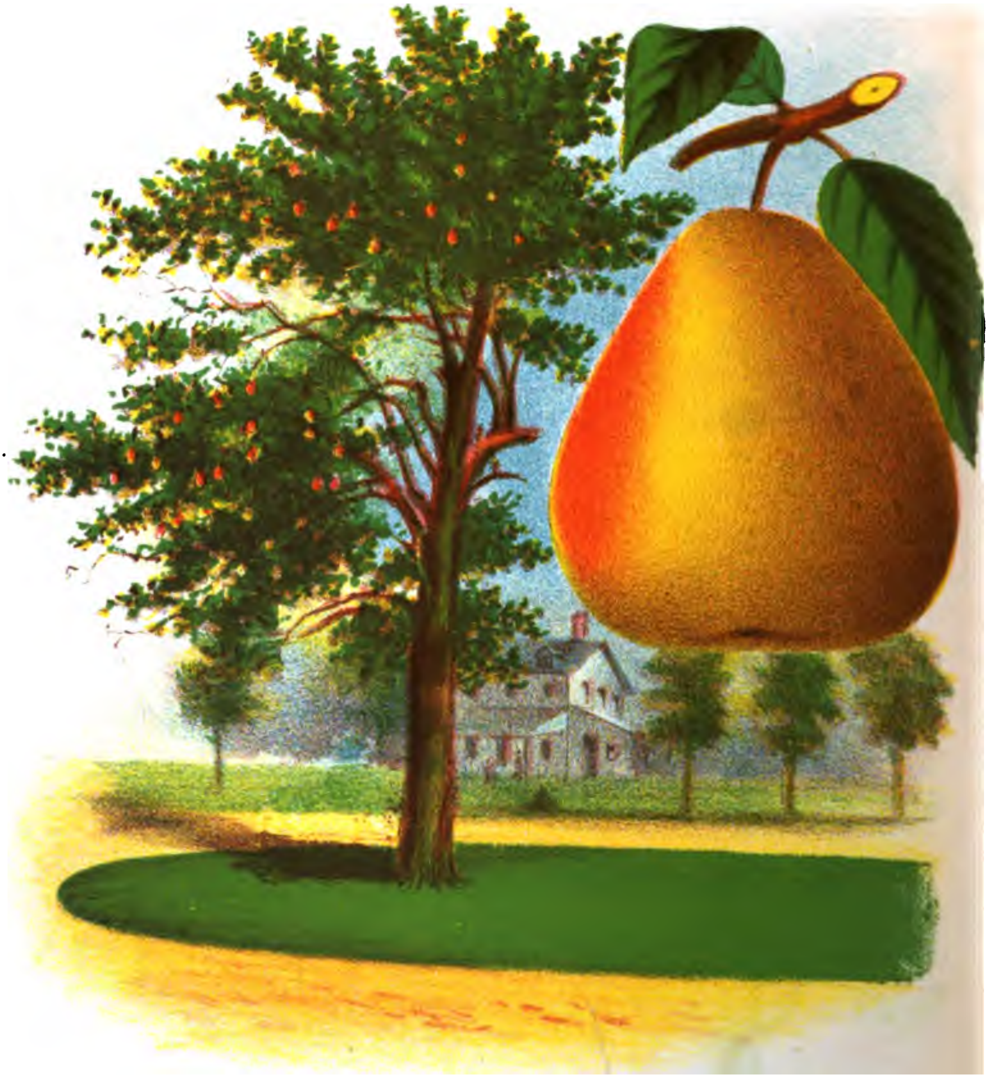




SECKEL PEAR AND ORIGINAL TREE

• A PENNSYLVANIA SEEDLING •



SECKEL PEAR AND ORIGINAL TREE

• A PENNSYLVANIA SEEDLING •

REPORT

OF THE

State Horticultural Association of Pennsylvania.

CONSTITUTION.

ARTICLE 1. This Association shall be entitled the "*State Horticultural Association of Pennsylvania*," and its objects shall be the advancement of the science of pomology, and the art of fruit culture generally.

ARTICLE 2. Any person may become a member of this Association by a vote of a majority of the members present, at any meeting, and by paying into the treasury the sum of one dollar annually; or the payment of one dollar to the treasurer, at any time, shall constitute membership, and entitle said member to a copy of the proceedings. The payment of ten dollars, at one time, will constitute life membership.

ARTICLE 3. Its officers shall consist of a President, three Vice Presidents, a Recording and Corresponding Secretary, and a Treasurer, all of whom shall be elected annually by ballot.

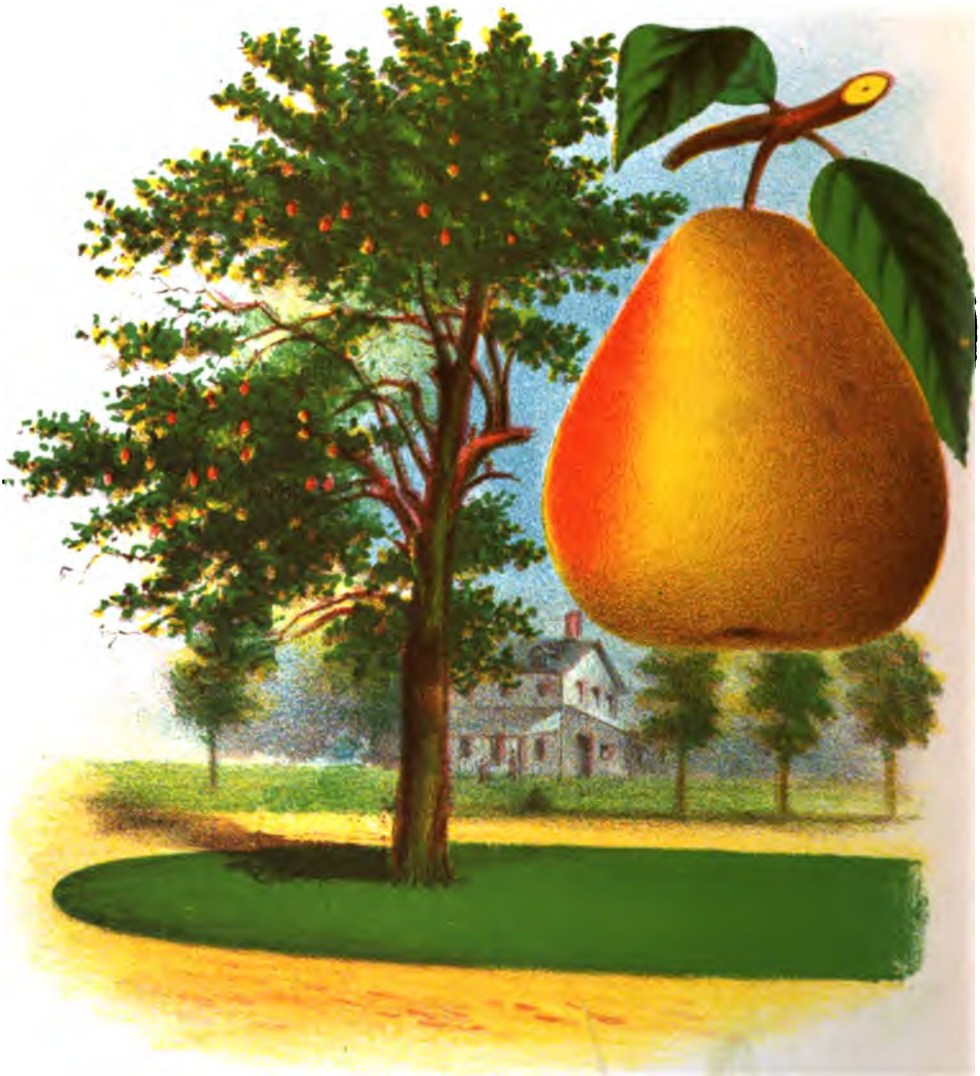
ARTICLE 4. The following standing committees shall be appointed: A Committee of five on Nomenclature; a Committee of three on Insects, of whom the professor of entomology shall be chairman; an Executive Committee, consisting of the President, Recording Secretary, and Treasurer; and a General Fruit Committee, consisting of one member from each county represented, with a general chairman of the whole; each member of the Local Fruit Committee to have the privilege of appointing two assistants.

ARTICLE 5. The Association may at any time elect honorary members.

ARTICLE 6. The Association may, from time to time, appoint professors on entomology, botany, horticultural chemistry, and geology.

ARTICLE 7. This constitution may be altered or amended by a vote of two thirds of the members present, at any regular meeting, notice of the proposed amendment, in writing, having been previously given.

ARTICLE 8. Seven members shall constitute a quorum for the transaction of business.



SECKEL PEAR AND ORIGINAL TREE

A PENNSYLVANIA SEEDLING

BY-LAWS.

ARTICLE 1. The Committee on Nomenclature shall collate and decide the standard and synonymous names of all fruits known in the Association, with the authorities for each, and report, so far as practicable, at each regular meeting, and record the same in a book kept for that purpose.

ARTICLE 2. The General Fruit Committee shall carefully and thoroughly investigate the subject of fruit culture in general. Each local committee of three shall collect such useful and interesting information in relation to the subject as may be in their power, and embody the same in monthly reports, to be made to the general chairman; such reports to be by him examined and embodied in his annual or semi-annual reports. Also, that the said county committee shall form *ad interim* committees for their respective counties; and further, that said *ad interim* committees are hereby authorized to publish their reports in the "*Gardner's Monthly*," or such other paper as they may select, the same having been first submitted to the chairman of the General Fruit Committee for his approval: *Provided*, That said publication shall be free of expense to the Association.

ARTICLE 3. The annual meeting of the Association shall be held on the third Wednesday of January of each year, at such place as the Executive Committee may appoint, at which time the election for officers shall take place; said officers to serve from the close of the meeting, at which they are elected, to the close of the succeeding annual meeting, at which time an exhibition and discussion of fruits shall take place, and other business transacted in the following order:

1st. Reading of minutes of previous meeting.
2d. Roll call and dues collected.
3d. Election of officers.
4th. Reports of officers.
5th. Reports of standing committees.
6th. Reports of special committees.
7th. Unfinished business of former meeting.
8th. New business.

The nomination and election of new members shall be in order at any time during the session.

ARTICLE 4. Other meetings may be convened by the Executive Committee at such time and place as they may appoint.

ARTICLE 5. No member who is in arrears for dues shall be eligible for any office, or serve on any standing committee; and any member who shall neglect to pay his dues shall cease to enjoy the privileges of membership.

LIST OF OFFICERS FOR 1882.

PRESIDENT.

GEORGE D. STITZEL, Reading.

VICE PRESIDENTS.

H. M. ENGLE, Marietta.
JOSIAH HOOPES, West Chester.
W. S. BISSELL, Pittsburgh.

RECORDING SECRETARY.

E. B. ENGLE, Marietta.

CORRESPONDING SECRETARY.

W. P. BRINTON, Christiana.

TREASURER.

GEORGE B. THOMAS, West Chester.

PROFESSOR OF BOTANY.

THOMAS MEEHAN, Germantown.

PROFESSOR OF ENTOMOLOGY.

S. S. RATHVON, Lancaster.

PROFESSOR OF HORTICULTURAL CHEMISTRY.

S. B. HEIGES, York.

COMMITTEES FOR 1882.

GENERAL FRUIT COMMITTEE.

E. Satterthwait, *Chairman*, Montgomery county.
A. R. Sprout, Lycoming county.
Joseph Lewis, junior, Delaware county.
Dr. James Calder, Dauphin county.
Dr. B. L. Ryder, Franklin county.
W. M. Pannebaker, Mifflin county.
J. V. Garretson, Adams county.
W. L. Shaeffer, Philadelphia.
E. P. Swift, Allegheny county.
H. S. Rupp, Cumberland county.
W. Voris, Northumberland county.
J. S. Keller, Schuylkill county.
S. Stevenson, Lackawanna county.
Bassler Boyer, Lebanon county.
J. W. Pyle, Chester county.
A. S. Shimer, Northampton county.
Calvin Cooper, Lancaster county.
Peter Lint, York county.
A. S. Sheller, Union county.
C. T. Fox, Berks county.
H. Leh, Lehigh county.
J. K. Sharpless, Columbia county.
M. B. Eshleman, Perry county.

COMMITTEE ON NOMENCLATURE.

Raphael Sherfy, *Chairman*, Adams county.
H. A. Chase, Philadelphia.
J. Hibberd Bartram, Chester county.
S. W. Noble, Montgomery county.
H. A. Longsdorf, Cumberland county.

COMMITTEE ON ENTOMOLOGY.

S. S. Rathvon, *Chairman*, Lancaster co.,
Ezra High, Berks county.
Herman Strecker, Berks county.

COMMITTEE ON ORCHARDING.

Dr. J. H. Funk, *Chairman*, Berks county.
Thomas M. Harvey, Chester county.
J. G. Engle, Lancaster county.
H. F. Clark, Columbia county.
Jacob Heyser, Franklin county.

COMMITTEE ON FLORICULTURE AND ARBORICULTURE.

Charles H. Miller, *Chairman*, Philadelphia.
P. C. Hiller, Lancaster county.
John C. Hepler, Berks county.
George Achelis, Chester county.
W. P. Brinton, Lancaster county.

COMMITTEE ON ARRANGEMENT AND RECEPTION.

Dr. James Calder, *Chairman*, Dauphin county.
H. S. Rupp, Cumberland county.
T. A. Woods, Dauphin county.
J. R. Eby, Dauphin county.
E. B. Engle, Lancaster county.

LIFE MEMBERS.

Bartram, J. Hibberd, Milltown, Chester county.
Brinton, W. P., Christiana, Lancaster county
Bissell, W. S., Pittsburgh.
Calder, Rev. James, Dauphin county.
Cornelius, Robert, Philadelphia.
Engle, J. G., Marietta, Lancaster county.
Engle, H. M., Marietta, Lancaster county.
Engle, E. B., Marietta, Lancaster county.
Garretson, Joel V., Flora Dale, Adams county.
Hayes, Charles P., Germantown.
Heyser, Jacob, Chambersburg, Franklin county.
Hildrup, W. T., Harrisburg, Dauphin county.
Hacker, William, Philadelphia.
Hoopes, Josiah, West Chester, Chester county.
Hiller, Casper, Conestoga, Lancaster county.
Hiller, Peter C., Conestoga, Lancaster county.
Landis, Israel, Lancaster, Lancaster county.
Martin, J. O., Mercersburg, Franklin county.
Pannebaker, William M., Lewistown, Mifflin county.
Reist, Peter S., Litiz, Lancaster county.
Shaffner, Jacob, Harrisburg, Dauphin county.
Thomas, George B., West Chester, Chester county.

HONORARY MEMBERS.

Barry, P., Rochester, N. Y.
Downing, Charles, Newburg, N. Y.
Elwanger, George, Rochester, N. Y.
Meehan, Thomas, Germantown, Pa.
Michener, Dr. E., Tough Kenamon, Chester county.
Parsons, S. B., Flushing, N. Y.
Parry, William, Cinnaminson, N. J.
Rathvon, Prof. S. S., Lancaster.
Rowe, Hon. D. Watson, Chambersburg.
Rutter, John, West Chester.
Saunders, William, Washington, D. C.
Thomas, John J., Union Springs, N. Y.
Warder Dr. John A., North Bend, Ohio.
Willetts, Rev. Dr., Philadelphia.
Wilder, Hon. M. P., Boston, Mass.

ANNUAL MEMBERS.

Achelis, George, West Chester.
Balderston, George, Colora, Cecil county, Md.
Biddle, F. C., Chadd's Ford, Delaware county.
Blessing, Paul, junior, Coatesville.
Boyer, Bassler, Lebanon.
Brandt, R. E. B., Mechanicsburg.
Branson, David H., Atglen, Chester county.
Breniser, Charles, Reading.
Brindle, A. C., Mechanicsburg.
Brinton, S. L., West Chester.
Brinton, Moses, Octoraro.
Carter, John I., West Grove.
Chaapel, Harry, Williamsport, Lycoming county.
Chase, Howard A., 2 South Merrick street, Philadelphia.
Chase, R. G., Geneva, N. Y.
Christmas, Isaac F., Stonersville, Berks county.
Clark, Hamilton T., Catawissa.
Cocklin, E. H., Bowmansdale, Cumberland county.
Cocklin, Jacob, Shepherdstown, Cumberland county.
Cooper, Calvin, Bird-in-Hand.
Crawford, Matthew, Cuyahoga Falls, Ohio.
Darlington, R. S., West Chester.
Davis, E. M., 205 Walnut Place, Philadelphia.
Dykeman, G. R., Shippensburg.
Eby, J. R., Harrisburg.
Eby, Simon P., Lancaster.
Edge, Thomas J., London Grove, Chester county.
Engle, Daniel G., Marietta, Lancaster county.
Epler, John H., Conewago, Lancaster county.
Eppihimer, Henry, Reading.
Erb, John B., Lampeter, Lancaster county.
Eshleman, Milton B., Newport, Perry county.
Feit, G. I., Phillipsburg, N. J.
Fisler, I. E., box 214 Harrisburg.
Foresman, D. H., Williamsport, Lycoming county.
Fox, Cyrus T., Reading.
Frantz, M. A., Harrisburg.
Fretz, A., Kreidersville.
Funk, J. H., Boyertown.
Garber, J. B., Columbia.
Geiger, M. Z., Geiger's Mills.
Gerhart, Dr. T. S., Beckersville.
Greenleaf, R. P., M. D., Henry Clay, Del.
Greth, A. C., Reading.
Greist, Jesse W., Flora Dale, Adams county.
Gross, D. W., Harrisburg.
Grover, Leverett, Windsor, Ohio.
Guthrie, W. D., Chambersburg.
Haines, Henry C., Germantown.
Haines, John S., Germantown.
Haines, R. B., Cheltenham, Montgomery county.
Hamilton, A. Boyd, Harrisburg.
Harrison, A. W., Queen street, Germantown.
Harvey, Thomas M., West Grove, Chester county.
Hay, Rev. C. A., Gettysburg, Adams county.
Heiges, J. M., York.
Heiges, S. B., York.
Hepler, John C., Reading.
Heling, Solomon, Catawissa.
Herbein, Dr. J. S., Sinking Spring.
Hershey, Simon A., Landisville.
Hertzler, S. M., Eberly's Mills, Cumberland county.
Hiester, Charles E., Harrisburg.
Hiester, Gabriel, Harrisburg.
High, Ezra, Reading.
Hoopes, Abner, West Chester.
Hostetter, H. F., Oregon, Lancaster county.
Huber, John, Litiz, Lancaster county.
Jameson, James, Reading.
Keim, Isaac W., Reading.
Keller, J. S., Orwigsburg, Schuylkill county.
Kendig, M. D., Cresswell, Lancaster county.
Kiner, A. M., Shippensburg.
Knabb, Jacob, Reading.
Kreigh, J. S., Catawissa.
Krick, Henry B., Sinking Spring.

Landis, B. L., Landis Valley, Lancaster county.
Lauer, H. Frederick, Reading.
Leh, J. H., Allentown.
Lewis, Joseph, junior, Newtown Square, Delaware county.
Lingle, John L., Harrisburg.
Linn, John, Chambersburg.
Lint, Peter, York.
Linville, J. C., Gap, Lancaster county.
Longsdorf, D. E., Mechanicsburg, Cumberland county.
Longsdorf, H. A., Mechanicsburg, Cumberland county.
Love, Thomas, South Bethlehem.
Manbeck, E. K., Sinking Spring.
Martin, Tobias, Mercersburg, Franklin county.
McCoy, C. C., Chester, South Carolina.
McFarland, J. Horace, Harrisburg.
McMillan, C. C., Gettysburg.
Merceron, F. F., Catawissa.
Miller, D. N., Harrisburg.
Miller, Charles H., Mt. Airy, Philadelphia.
Mishler, E., Reading.
Mitchell, J. E., 310 York avenue, Philadelphia.
Mumma, Hon. D., Harrisburg.
Neff, J., Dallastown, York county.
Nimson, C. H., Allentown.
Nissley, C. B., Mechanicsburg.
Noble, S. W., Jenkintown, Montgomery county.
Oberly, Erwin, Easton.
O'Neill, Edward, Bethlehem.
O'Neill, Michael, Scarlet's Mills.
Ort, Henry, Lewistown, Mifflin county.
Parker, J. T., Mercersburg, Franklin co.
Potts, R. C., Lewisberry, York county.
Purple, S. H., Columbia.
Pyle, J. W., Willow Dale, Chester county.
Rakestraw, Thomas, Willow Dale, Chester county.
Ralston, John, Reading.
Reed, William G., Chambersburg.
Reeder, Hiram T., Cattawissa.
Reist, Levi S., Oregon, Lancaster county.
Reynolds, S. H., Lancaster.
Rhoads, Dr. R. B., Douglassville, Berks county.
Ritter, W. S., Reading.
Roberts, Rowland, Horsham.
Rufe, Morgan, Doylestown.
Rupp, H. S., Shiremanstown, Cumberland county.
Rush, John A., McVeytown.
Ryder, Dr. B. L., Chambersburg.
Satterthwait, E., Jenkintown, Montgomery county.
Saxton, J. O., Mechanicsburg.
Scarlet, Levi, Christiana.
Schaffer, W. L., Girard National Bank, Philadelphia.
Schneller, Simon S., Bethlehem.
Shalter, Edwin, Reading.
Sharpless, J. K., Catawissa.
Sheetz, J. A., Womelsdorf, Berks county.
Sheller, Alf. S., Lewisburg, Union county.
Shelly, Daniel, Shiremanstown, Cumberland county.
Sherfy, Joseph, Gettysburg.
Sherfy, Raphael, Gettysburg.
Shimer, A. S., Redington, Northampton co.
Shoch, Samuel, Columbia.
Shoemaker, R. C., Jarrettstown, Montgomery county.
Sibbett, R. Lowrie, M. D., Carlisle, Pa.
Small, Samuel, York.
Small, Samuel, junior, York.
Smith, Dr. A., Wernersville.
Smith, F. L., Reading.
Smith, Patrick, South Bethlehem.
Snavely, H. C., Lebanon, Lebanon county.
Snively, John K , Jackson Hall, Franklin county.
Sprout, A. R., Picture Rocks, Lycoming county.
Stahle, H. J., Gettysburg.
Steck, Dr., Picture Rocks, Lycoming co.
Stevenson, S , Clark's Green.
Stichter, J. L., Reading.
Stitzel, George D.. Reading.
Stone, George A., Rochester, N. Y.
Strode, A. Darlington, West Chester,
Suesserott, Dr. J. L., Chambersburg.
Swift, E. P., Mt. Oliver, Allegheny county.
Thomas, Jos. W., King-of-Prussia, Montgomery county.
Underwood, Alexander, Mechanicsburg.
Voris, William, Pottsgrove, Northumberland county.
Wagner, Henry, Reading.
Wanner, Peter D., Reading.
Weaver, Reuben, Mastersonville, Lancaster county.
Weiser, B. H., York.
Williams, J. S., New Hope, Pa.
Woods, T. A., Harrisburg.
Yates, David G., 5774 Germantown avenue, Philadelphia.
Yoder, Joseph L., Bethlehem.
Young, John G. B., Reading.
Young, William M., Reading.
Zerr, Jacob G., Geiger's Mills.

STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

With this twenty-third annual report of our society, we don our new title adopted at the last meeting, and confirmed during the sessions just closed. We have now a broader, more comprehensive name, and we enter a correspondingly wide and interesting field for labor and investigation. The meeting was one of the largest and most interesting ever held by the Association.

Harrisburg is centrally located, easy of access from every portion of the State, and many old friends, whose familiar faces were missed for years, came to renew their acquaintanceship, while new ones also came to join us and encourage us by their presence. The display of Pennsylvania fruits was meager, owing to the general failure of the fruit crop the past year. There was a very fine display of Virginia apples, which attracted general attention. Also a fine assortment of Primroses, notable for vigor of growth and variety of color. To Mr. Thomas J. Edge, Secretary State Board of Agriculture, who kindly furnished us a place of meeting. and to the local committee of arrangements, Messrs. Calder, Rupp, and Woods, the Association is under special obligations for the comforts and conveniences it enjoyed. That the meeting was, by general consent, considered a success, was evident from the fact that by a very decisive vote, Harrisburg was again selected as the place for our next annual meeting, in January, 1883.

THE MEETING.

At 2.30, P. M., January 18, 1882, President **STITZEL** called the members to order, and announced that the hour for the transaction of business had arrived. The Secretary then read the minutes of the last annual meeting, which were approved.

Mr. **HOOPES**. Instead of dispensing with roll call, as has been customary, I suggest that the Treasurer call the roll of members, to see who really are present.

Mr. **ENGLE** hoped members would rise and respond to their names, we would thus have a better opportunity of seeing who are here.

The Treasurer, Mr. **THOMAS**, then called the roll, after which a number of members came forward and renewed their membership for the present year.

Mr. **ENGLE** moved that a committee be appointed to prepare further business for the Society. He did not wish to crowd out any of the essays or addresses that had been prepared, but thought best to have additional work on hand, in case we get through the regular programme. He suggested, also, that a "Question Box" be placed upon the table, and members be invited to place therein such horticultural questions as occurred to them during the meeting.

The motion was adopted, and the following committee appointed by the Chair: H. M. Engle, Dr. James Calder, Josiah Hoopes.

Mr. ENGLE. It has been customary first to read report of General Fruit Committee. According to our by-laws, election of officers precedes this, but it is usually postponed until there is a fuller attendance of members.

Report of chairman of General Fruit Committee, with sub-reports, were then read by the Secretary.

To the President and Members of the Pennsylvania Fruit Growers' Society:

The chairman of the General Fruit Committee has had brief reports from twelve out of the twenty members of the committee, and is sorry to say that they are not very encouraging to the fruit grower.

The strawberry crop, however, was the best we have had for years past, for which we can say thanks to a wet June, it being the first wet June we have had in ten years. Strawberries must have rain. After the fruit is set, rain every day will do them good. If we should have a repetition of dry Junes we will have to plant in moisture-retentive soils, or which we can irrigate, or quit the business, as there is no money in it in dry weather and dry soils.

The prominent varieties the past season were Charles Downing, Cumberland, Triumph, Miner's Prolific, and Sharpless. The latter, in a matted bed of seventy square yards, yielded one hundred quarts, that averaged twenty cents a quart. The bed was in its second year—was left run wild for the sake of plants, but in the spring the plants were not wanted—was then somewhat thinned out, and then looked about as unpromising as a strawberry bed well could look.

Cherries, upon the whole, were no success. On some of the higher situations the crop was medium. The great trouble with this fruit is rot. This is a trouble of a comparatively recent origin, supposed by some to be caused by the introduction of tender varieties; but this is hardly the case, as the old natural varieties rot as badly as any. On elevations of several hundred feet, where the atmosphere is purer, the rot is much less prevalent, and, in such situations, cherry culture could be made profitable. Early Purple Guigne and Conestoga are the most valuable of the old varieties, but the former is visited by myriads of that intolerable nuisance, the cedar bird, that cleans out a tree of its fruit before it is ripe. The remedy is to plant trees enough, and then erect an observatory among them, and place a watchman thereon, and furnish him with bird-scaring implements.

Raspberries and blackberries are not extensively cultivated in Central Pennsylvania. The pleasures and profits of their cultivation are marred by the frequent freezing or winter-killing of the canes. In the remarkable past cold winter they froze less than they often do in much milder winters. The crop was medium. The Gregg, among blackcaps and the Cuthbert, among the reds, are reported the most promising of the new varieties of raspberries.

The peach crop was almost an entire failure through the State, owing to the severe winter. Many trees, on low locations, were winter-killed. On quite high ground in Lancaster county we had some peaches that were fine and brought high prices. On such situations it would appear safe to plant extensively, as experience has shown that the fruit rarely fails.

The old varieties, Early Rareripe, Old Mixon, Crawford's Late, and

Smock do not appear to have been superseded by any of the newer varieties. The gain in the newer varieties is that they lengthen the fruit season several weeks.

The pear crop, from the reports of the members of the committee, has, upon the whole, been quite favorable. It is a fact worthy of note, that the pear crop seldom fails in making a medium or large crop. The only serious drawback in the culture of this delicious fruit is blight. This insidious disease has, during the last ten years past, destroyed one half the trees planted, which is very discouraging to the planter. The past season was, however, almost blight free.

Mr. A. S. Shimer reports having twelve hundred trees entirely blight-proof this year, and others give similar experience.

Our horticultural friend, J. B. Garber, has had the Chinese Sand pear on his premises since 1832. It never had a sign of blight, while most other varieties have blighted with him. In my orchard of one hundred trees, (twenty-five years old,) every variety has blighted more or less, except the Sand and the Maynard.

Daniel Smeych, of Lancaster, one of our best amateur pear growers, reports a case of blight on the Keiffer. This affected the young wood, turned the bark jet black, while the leaves remained green for some time. It proved fatal to the tree.

For the odd year the apple crop was plentiful, but the general drought made sad work with the later varieties. At the time of gathering and storing there were few left to gather, and these few were in no condition for keeping. The summer apples, such as All Summer, Sine Qua Non, Benoni, Townsend, Jefferies, and Maiden's Blush, were in general very fine. We have continued good words for York Imperial and Smith's Cider. Mr. Garretson says York Imperial with him is never-fail, and L. S. Reist says his Smith's Cider promises to keep until spring.

The outlook for successful apple culture is not encouraging. We have as good clay loams (the best soil for orchards) as the world can produce, but our summers, of late years, are too hot and dry to perfect the fruit. Can we find a remedy?

My attention was drawn to an orchard planted on low level land, with a small stream of water running through it, not more than two or three feet below the surface, which withstood the effects of the heat, as shown by such varieties as the Smokehouse, hanging on the trees until late in the season. Northern slopes with deep soil also showed the ill-effects of drought and heat less than southern slopes.

Prof. Budd, of Iowa Agricultural College, thinks we have some remedy in the selection of varieties that are better able to withstand heat and drought than most of our old varieties, and asserts that most of the Russian apples, the Chinese and Moscow pears, the Vladimer and Ostheim cherries, also from Russia, the plum Simoni, from Northern China, the cut-leaved Russian mulberry, and many other plants from high latitudes, retained their foliage and vigor to a remarkable degree in the extraordinary hot and dry summer. Where the wood was not injured by last winter's excessive cold, the grape crop was quite fair. We have been introducing scores of new grapes during the last twenty years, but we rarely see anything in our markets but Concord, Hartford, and Telegraph. This would indicate that the great majority of recent introductions are so very good that the possessors eat them all themselves, or are so poor that they are not worth sending to market.

Respectfully submitted in behalf of Fruit Committee.

CASPER HILLER,
Chairman.

SUB-REPORTS.

LEBANON, PA , *January 14, 1882.*

TO CASPER HILLER, *Chairman of the General Fruit Committee:*

MY DEAR SIR: I scarcely know what to report for Lebanon county, by reason of the almost entire failure of our general fruit crops. Small fruits did reasonably well; cherries were abundant; pears afforded an ordinary crop, but apples and peaches were almost total failures. The dry weather has much, if not the most, to do with this, but independent of this, there are other producing causes, and it is only by avoiding or preventing those that the evil can be remedied.

In apples I have found a seedling which would seem to come up to your idea of the winter apple for this section, one that will not insist on severing its connection with the tree before the dark of the moon in October, but will hang on into the colds and damps of November, and, when picked, will have the semblance more of a stone than of what it actually proves, from February until the following July. It is a seedling growing in the orchard of Mr. John Gasser, one of our county commissioners, near this place. It is of medium size, green skin splashed with red, flesh tender, juicy, aromatic, with just enough acid to fit it for both the table and general culinary purposes. The tree is very productive, in its bearing year, but up to five years ago was valued only for cider purposes, no attempt having ever been made to ascertain its keeping qualities. The latter were developed by an accident, and since then the tree is more highly esteemed by Mr. Gasser than any other in his orchard. Its crop of 1880 was wonderful—the result was, it bore nothing last year, a lesson which its owner purposes profiting by. I purchased a bushel of the fruit last June, and, in order to test it, kept specimens, in an ordinary bin in my cellar, into July, and on using them found them as perfect as when picked from the tree, full of juice, and equal in flavor to any winter fruit I had ever eaten. I had hoped to lay specimens of it, together with other local seedlings before you, but, through the general failure of the crop, am deprived of the pleasure of so doing. Another apple (long keeping) which has been tested in several sections of this valley, and which has proved highly satisfactory, both as a long keeper and a first-class producer, is the Rock Pippin, grafts of which were sent to me by a gentleman from Ohio, whose name has escaped my memory, in return for grafts of the Northampton apple, about eight years ago. The fruit of this variety is also of medium size, excellent in quality, and keeps in good condition until the advent of the Early Harvest. I propose testing a suggestion of the Society, as to winter apples, by importing the Schockley and several other southern varieties. What my success will be remains to be seen; the game, however, is worth the powder. The few orchards which, with us, bore fair crops the past season were all located on low grounds, with a tough, clayey sub-soil, at least so far as the same came to my knowledge. But, even in those rare instances, premature ripening has reduced the local supply down to nothing. As to early varieties of apples, I can add nothing to my report of last year.

Although our soil and climate are especially adapted for the growing of the pear for market, the cultivation of this fruit is limited in the main to a few neglected trees for a home supply. Little is done in winter pears, here and there a Lawrence or Winter Nelis. I yet proclaim the claims of the Doyenne D'Alencon, which, with me, is not only productive, but with the rudest treatment, simple tumbling it into a bin after the fall of the leaves, and its consequent readiness for picking, begins ripening off about the first of February, without the care necessary to bring out a Glout Morceau and other varieties. I also find it to hang well on the tree, withstanding, successfully, severe storms of wind, and succumbing only to freezing weather. The Reading pear does nearly as well, ripens without care, and, unlike its reputation with Judge Stitzel and others, bears large crops in an open fruit garden, exposed on all sides, without the least protection from buildings. Buerre D'Anjou is going backward with us, and rarely perfects its fruit. I know of at least a dozen owners of trees, and they all report the same result.

Peaches, budded varieties, were as a general thing, failures. Seedlings, on the contrary, mostly bore fair crops. The only orchard of budded trees that gave even an ordinary crop, is located on the very top of one of the spurs of the Blue mountains, in the northern portion of the county. The varieties, mostly Morris White and the two Crawfords, produced about half crops, while almost within call, at the foot of the mountain, not a sign of a budded peach, although many were in a bearing condition, could be seen. This orchard had a similar experience some years ago, and the coming spring will see the crests and southern slopes of almost all the foot hills of the Kittatinny range covered, or at least dotted with newly planted peach orchards. Our people are succeeding better with the peach, since they have learned that it will pay to feed the trees, especially by giving them all the potash at ready command. I have not dug for a borer in five years, and yet have not lost a tree through its operations. My only remedy was insisting on the application of occasional doses of chamber lye to the base of the trunk.

Our people have, in some neighborhoods, planted the quince quite extensively. In some instances, contrary to advice, they have been set upon gravely hillsides, and what the harvest will be, time will tell. I have been accused of croaking, when lamenting the act, but I cannot set aside the results of my own experience, and wait for the fulfillment of my prophecy.

Plums are not a successful fruit in this vicinity. One of our amateur growers has been remarkably successful, even with the rare old Green Gage, by dressing his plum garden with heavy top dressings of chicken droppings, to which the curculio seems averse. I intend mulching several of my trees with tobacco stems, and trying the effects of the weed on the little Turk. I expect much from this, and if living, I will report the result next year.

Raspberries and blackberries were short in their returns. Most of the newer varieties are on trial through the county. The same can be said of currants, the currant worm having had full sway the year before, and been hellebored only after he had done his work.

Strawberries did well enough, but the crop came to an abrupt termination, when almost at its best. The newer varieties of this fruit are also being extensively tested. The Sharpless gives the most general satisfaction on all soils.

Grapes were abundant, but the general complaint was not only that they lacked juice and flavor, but also of the toughness and indigestibility of the pulp, most especially as to the Concord and Martha. After ascertaining their unhealthy condition, through the experience of the entire family, I left the fruit of the two varieties named hang, and dry up on the vines. This was done by other growers (amateurs) who had a similar experience with myself.

The "winter-keeping grapes, which would keep in an ordinary bin like an apple until March or April, and come out as fresh as when plucked from the vine." were quite extensively sold around here by peddlers last winter. They varied in their rates, getting all they could. The purchasers, although warned through our papers, as a general thing took the vines, paid their money, and are now waiting for the enjoyment of the luxury of fresh grapes in and after mid-winter. My opinion hitherto fully expressed in writing and verbally, to both spoiler and victim is, that they will wait a "wee bide" longer for the fruition of their hopes. Some had "bearing vines," and grumbled when nothing appeared last fall, but the drought was a specious pretext, and the agent was given another breathing spell.

Why is it, that the Pennsylvania Dutchman is so willing to become the victim of any and every sharper who may see fit to apply his trade upon him? Patent rights, fancy fruits, insurance speculation, anything and everything to take the hard earned dollars out of their shot bags, find a ready customer, and since we both belong to the new race, and you are considerably my senior, you may be able and willing to enlighten me.

I have, however, spun out long enough, and must have done. I expect to meet you in Harrisburg. Pardon my delay. I mislaid your letter in the hurry and bustle of the holidays, and my preparation for court.

Very respectfully, &c.,

BASSLER BOYER.

GIRARD NATIONAL BANK,
PHILADELPHIA, *December 24, 1881.*

CASPER HILLER, Esq., *Chairman:*

DEAR SIR: In answer to your request, I make the following report.

The peach crop in this vicinity was a comparative failure, owing to the extreme cold of last winter. The early apples and pears were good, but the late varieties were seriously injured by the long continued dry weather.

The cherries were a good crop, particularly the Conestoga, which with me is the most profitable of all varieties, and one of the best, the tree being a healthy, vigorous grower, producing good crops every year. I would plant it in preference to any other variety with which I am acquainted.

With me the most profitable apples to grow are: Prince's Early Harvest, Early Strawberry, Gravenstein, Porter, McLellan, White Doctor, Cornell's Fancy, Pennock, and Smith's Cider, the most productive of all.

Pears—Doyenne D'Elé, Osband's Summer, very fine, Beurré Gifford, Bartlett, Seckel, Dana's Hovey, and Lawrence.

I caught, with hay bands, this season, about four thousand codling moth grubs, and by jarring my pear trees, commencing about August 1, and ending in October, one thousand four hundred curculios by this means. I had the best crop of Lawrence pears I have had for some years.

Very truly,

W. L. SCHAFFER.

NEWTOWN SQUARE, DELAWARE COUNTY, PA.,
December 21, 1881.

MR. CASPER HILLER:

DEAR SIR: A report of the past year's fruit crop in this vicinity will be easily made.

Summer and autumn apples were comparatively plentiful, but winter varieties were scarce, excepting Smith's Cider, which produced a fair crop, but owing to the dry weather or other causes, they dropped badly. The old Grindstone variety produced a fair crop, but there were but few apples gathered for winter use, most of them having fallen before the time of storing them.

Pears have been a plentiful crop, especially Bartlett, and with us very fine. Such varieties as Howell, Beurré Clarigeau, and Lawrence bore profusely. I think the fruit was not so perishable as some seasons. As far as I have tested, I am much pleased with the Rutter, and think Dana's Hovey promises well also.

I have not found Urbaniste generally a great bearer, but this year the crop was good, and the quality excellent. A half dozen varieties would embrace all I have found profitable for market. The Seckel, I think, I would not include, so much of the crop is lost in comparison to the few well ripened. Respectfully,

JOSEPH LEWIS, Jr.

READING, PA., *January 11, 1882.*

CASPER MILLER, Esq.:

DEAR SIR: My time has been so much engaged of late, that I have neglected writing to you in reference to the fruit crop of last year in Berks county. We are, however, so much in the same region, that what is true of the crop in your section, will no doubt fully apply to Berks.

The out-look in the beginning of the year was favorable to most varieties of fruit, but the subsequent drought, extending over a period of nearly three months, had a disastrous effect. Fruit of all kinds dropped from the trees, and that which remained ripened prematurely. This was the case especially with the apple crop, and the keeping qualities of winter fruit were impaired by premature ripening. The month of June was unusually wet, and there was a short crop of strawberries in consequence. The early varieties did remarkably well, and larger berries were never produced. The Sharpless, for size and marketing purposes, has proved the favorite variety in this vicinity. Some enormous specimens were reported during the season in the daily papers of this city. The cherry crop was large, but the fruit rotted on the trees during the wet weather of June. In some sections of the county there was a fair apple crop, notwithstanding the drought. The Reading markets are being supplied almost entirely this winter with apples produced in the county, which are being retailed at twenty to thirty cents per half peck, according to quality.

There was a large crop of early summer pears, and the fall varieties also did well. The late crop was injured by the drought. There was a fair yield of the favorite winter variety, which originated in this city—the Reading pear. The peach crop was a total failure, the buds having been frozen by the extreme cold weather of the previous winter. This was a loss of thousands of dollars to the peach district in the southern portion of this county, where over fifty thousand trees are under cultivation.

Plums are not grown to any extent in Berks, but in the eastern portion of the county there are several districts where there are groves of German Prunes, which yielded abundantly. In one neighborhood several hundred bushels were bought at one dollar and fifty cents per bushel, for shipment to the Philadelphia and New York markets. There was a fine crop of grapes, and the saccharine quality of the fruit was improved by the dry weather. The Clinton variety did exceedingly well, and large quantities of wine, of the finest quality, were made in the vineyards around Reading. Quinces did poorly. In several localities the fruit was attacked by a fungus blight, and proved worthless. The crops of small fruits were generally scant, and, upon the whole, the fruit-growers of this county had but little encouragement. The prospects for the ensuing year seem to be more favorable, and it is to be hoped that the fondest desires of our fruit-growers may be realized.

Yours, very respectfully,

CYRUS T. FOX.

PICTURE ROCKS, *December 23, 1881.*

Gentlemen, Members of Pennsylvania Fruit Growers' Society:

My appreciation of your kindness is herewith offered, together with my apology for non-attendance. Other pressing duties pertaining to getting on in the world, seemed to have gained precedence, but you will please accept my best wishes, that your present session may be interesting, instructive, and at least a step in advance in the march of progress. I can scarcely recall the time of meeting with you, or looking over reports of your meetings, without feeling that I have in some way received benefit, and shall as ever, hereafter feel an interest in the affairs of the society.

Admitting that associated bodies have a future, as well as a present and past, and that to keep pace with the progressive, position needs be taken at the front, I would respectfully suggest that this society (if need be, at the expense of the present) take up the subject of evaporating, canning, and cold storage of common fruits, that the same may be more effectually utilized and turned to account. If in this there is not sufficient grounds for operation, we may with equal profit, take up the matter of sugar production from the beet root or amber cane, that instead of glucose, (by use of which we lose our preserved and canned fruits,) we may have a pure article with sweetening power sufficient to save from fermentation, and that our own State may have credit of being even, if not in advance of others. The beet root sugar question has already been discussed in our section, and we think at no distant day, both it and the amber cane will be successfully grown producing our own sugars and syrups. In this matter we shall be glad to coöperate with you.

Very respectfully yours,

A. R. SPROUT.

The following letter was received by the secretary, during the meeting:

PHILADELPHIA, *January 17, 1882.*

E. B. ENGLE, *Secretary Pennsylvania Fruit Growers' Association:*

It is with much regret that I find myself unable to be with you at your coming meeting, as I am always profited by them. Having been for many months an invalid, I am here under medical treatment, and closely confined. For this reason I have failed to reply to inquiries made from the committee, which I now supplement very briefly.

Notably, the main features of the past season in Lackawanna county, were the persistent drought, which made all fruits ripen prematurely. Upon Vicar pear, this has been the most favorable of many years past, the fruit being almost uniformly well flavored. Winter Nellis has also surpassed itself, and the pear crop generally was heavy.

Cherries were abundant, more especially Early Richmond, which keeps its place at the head of all the tart cherries for profit. The severity of the past winter prevented all peaches from blossoming, except Early Crawford and Early York, which bore, sparingly, magnificent specimens.

The pear blight continues to spoil neglected orchards and gardens, but my knife and saw have kept me nearly whole in several thousand trees. Souvenir D'Congres has given me specimens of seventeen ounces, and is with me a fine pear. I have found White Doctor and Gewies Good apples, taken in scions from Berks county, valuable acquisitions. Keim and Krauser very much less so.

Very respectfully,

S. STEVENSON.

YORK, PA., *December 30, 1881.*

MR. CASPER HILLER, *Conestoga*, *Lancaster county*, *Pa.:*

DEAR SIR: I have been wishing to report to you, about the fruit crop, several weeks sooner, but was so pressed for want of help during summer that I even now hardly got time to write to you, but will try to send you more or less of a report.

In general, the apples were not more than one fourth of a crop in York county, as most everywhere else. The early varieties were about two thirds of an early crop, and average quality. The old varieties, and those of pippin nature, were the most plenty. The newer and darker-colored varieties, as Early Strawberry and Red Astrachan were few. Of the late and winter, most varieties did not blossom. Of the fall varieties, the Smokehouse and Maiden's Blush made one half of the supply in market, altogether making just a fair supply in the York market. Price, from six to ten cents per half peck. Smokehouse was a full crop, but Maiden's Blush was the heaviest crop I ever saw; trees full everywhere. Both varieties were of average size and quality.

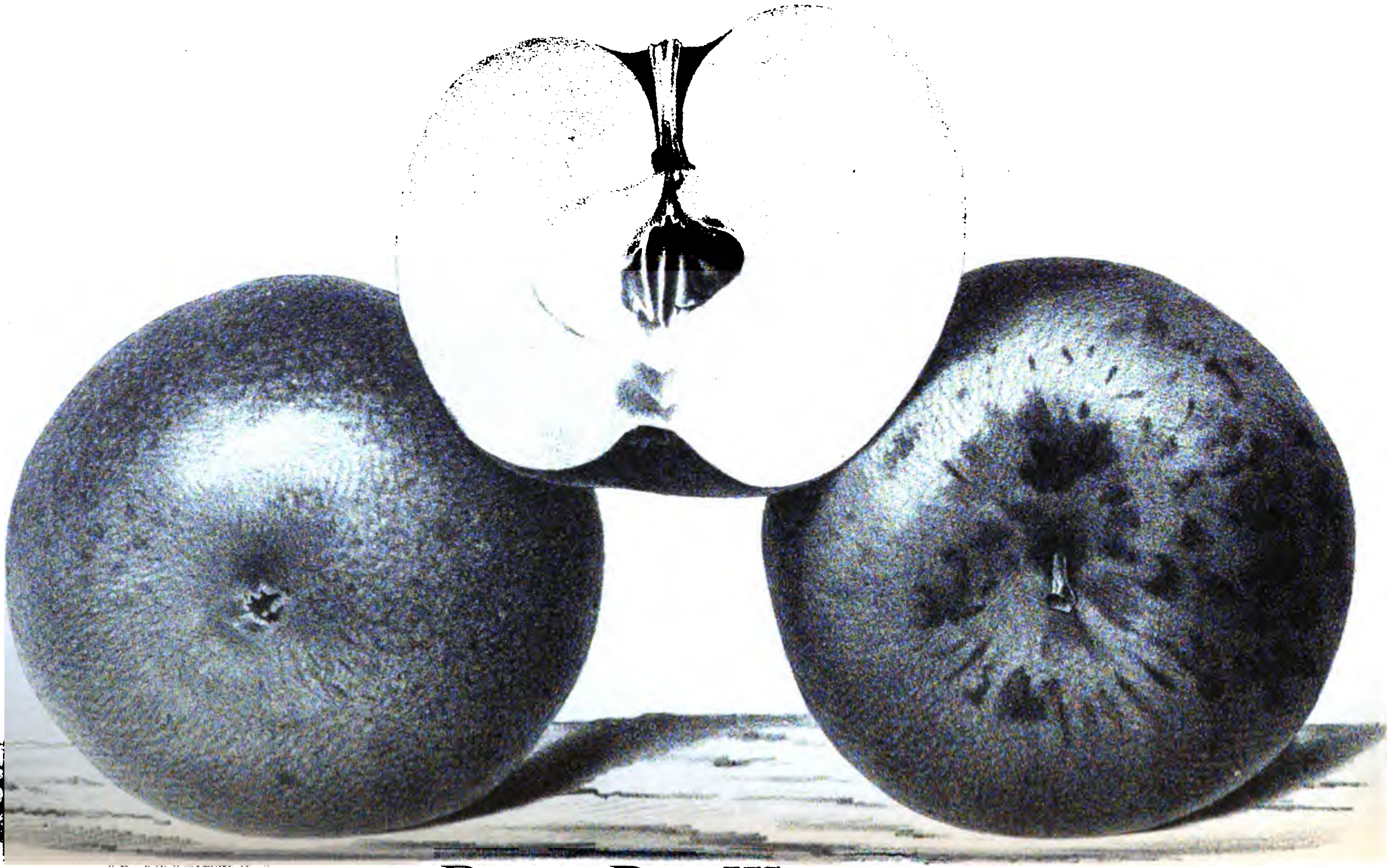
As said, most winter varieties did not blossom, and are generally scarce, except on top of and along the southern slope of the Codorus hills, between York and Wrightsville, a stretch of ten miles, one to one and a half miles north of the railroad between the two places, where most all trees, young and old, were full enough, and so nicely distributed over the trees that it was a pleasure to look at them. But this year, like the three previous, apples fell off much more during August and September than usual, and after they were picked I judge that one third specked and rotted, from the effects of insects and the unusually long warm season.

Pears.—About pears I will not undertake any exact report as to quantity; they were very irregular—some places many, at other places few or none. Most all the trees would have blossomed, with few exceptions, and I think would have had a crop of pears, but small insects, what kind I am not sure but think they were the honey lice or aphide, that worked on the blossom from the time they came out of the wood till they got to opening size. On some trees they destroyed all till they got fairly out of the wood, on other trees they destroyed only a small proportion, and the trees got full enough. They do not eat the blossom but it appears they suck out the sap at the base, inside the bud, where the leaves and blossoms are attached. On my trees they destroyed at least seven eighths of the blossoms. Some trees that had no blossom buds they nearly killed by destroying most of the leaf buds. Those insects, whatever they were, did their mischief at night; I could not find any in daytime.

Some pears, except winter, were some smaller in size than usual; average in appearance and quality. What there were of winter pears were of usual size and appearance, but, on account of the hot season, ripened four to six weeks earlier, and the flavor of the best.

Peaches may be called a total failure, on account of the cold winter. Except some places, a few on trees standing on high hills, but those were of the best quality and flavor, and sold in York at from fifty to seventy cents per half peck.

In reference to peach trees in York and vicinity, almost without exception, wherever I came to, they were nicer green looking than usual. I must say I often was astonished when I looked at their fresh appearance, as if all were specially attended to. This I ascribe to a peculiarity of the atmosphere, which, with us, was much of the time more damp than usual during midsummer, even when the sky was most all clear. It was the first year I



PYLE'S RED WINTER.

know of that there were no curled leaves. So the tops did not give suspicion of wrong in any way, when I was surprised, a second time, to find, in the fall, that some places half the trees had borers at the roots, without the tops showing any or little effect. There were as many this year as five or more other years together, because peach-tree borers, were few, in previous years, in York and vicinity.

Truly,

PETER LINT.

Mr. MEEHAN. These reports are interesting, and suggest many points for the consideration of the committee on business. One reports a heavy crop of strawberries, the first in ten years. Another reports cherries rotting badly, and attributes the cause to the tender varieties now in cultivation. Surely these are questions open for discussion, and liable to bring out conflicting opinions. Also, grapes; some report nothing left but Concord and Clinton. I hope the committee on business will suggest some of these questions before we finally adjourn.

The annual report of the treasurer was then read, and on motion, accepted and referred to an auditing committee consisting of Messrs. Chase, Boyer, and J. G. Engle.

The secretary then read the following letter in reference to the practical workings of the yellows law in Michigan, by Reverend James F. Taylor:

DOUGLAS, MICH., *January 11, 1882.*

Mr. E. B. ENGLE, *Marietta, Pa.:*

DEAR SIR: In answer to your inquiries about the practical results of the yellows law of Michigan, I am pleased to say that the workings of the law, thus far, seem to be very favorable, and the outlook for the future highly encouraging. We were slow to realize our danger at first, but of late, I think most of our peach growers have become fully aroused to the magnitude of the evil, and are striving to eliminate every appearance of it. Had the disease first made itself known here instead of at St. Jo, forty miles south of us, our orchards would doubtless have perished, and theirs might have been saved. We learned the devastating nature of the yellows by seeing the great evils it was working in those beautiful and extensive peach orchards that once spread out over the western part of Berrien county. Some of our peach growers went there to see how the disease worked, and to note its symptoms, and they were alarmed at the destruction of so many trees in a single year. The reports which they brought back produced a profound sensation among our fruit men, and resulted in the law of 1875, but as this law was local in its operation, covering only three counties, situated north of the infected district and contiguous to it, no extended work

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PYLE'S RED WINTER.

A chance seedling, which originated on the farm of Baynard Pyle, Esq., in Thornbury township, Chester county, Pa. It is claimed to be of great value as a market variety, being large and showy, of good quality and a good keeper. The following description is by Charles Downing:

"Fruit large, roundish, oblate, slightly conic, sometimes slightly oblique. Skin greenish-yellow, or pale yellow at full maturity, shaded with pale red over two thirds its surface, with some rather obscure stripes and splashes of a darker color, and moderately sprinkled with light and brown dots; stalk short, small; cavity rather large; calyx small, closed; basin large deep, slightly wrinkled; flesh whitish yellow, half fine, crisp, tender, juicy, pleasant, lively sub-acid. Core rather small. January to March."

of extermination could be carried on, and yet this law was a great help to us. Under it commissioners were appointed in the most important localities, who went through their respective townships, marked the trees that had the yellows, and explained the nature of the disease and pointed out the necessity of cutting them down without delay. But little was accomplished under this law, except that the people learned the destructive nature of the disease. Only a few trees were found at first, some of these were cut down, while others were left by neglect, and others hoped to find a cure, but no cures were found.

In the summer of 1878, the disease came out with new force, and in almost every orchard a few diseased trees were found. Nearly every man was ready and willing to take them out as soon as they were marked by a commissioner. In 1879 the law was amended and extended over the whole State, and, so far as I can learn, with good results. In those orchards where all diseased trees were taken out, as soon as they were identified, the loss has not been more than one per cent., or less. In some orchards, where the loss in 1878 amounted to ten per cent., and thorough work of cleaning out was then carried forward, the loss this year has not been more than one per cent. What we most fear at present is, that men who have a few trees in secluded places will neglect them to the detriment of those who are vigilant in trying to exterminate this fell destroyer. Every man, as far as I know, who has been thorough in taking out diseased trees as soon as they appeared, is satisfied with the result, being already assured that the trees which remain are less liable to be injured. Wishing you a good meeting at Harrisburg next week,

I remain yours truly,
JAMES F. TAYLOR.

Mr. **BALDERSTON**, referring to report of chairman of General Fruit Committee, asked about the record of the Sharpless strawberry among members of this society. It seems to have a contradictory record, good in some places and bad in others. This report is at variance with all reports of it I have yet seen. Have fruited it three years, and it has not been very satisfactory. It grows in compartments, some are green, some are ripe. One of the best fruit-growers on the Hudson says it should be grown in hills, not in matted rows. My experience with the Sharpless is that it is not profitable.

Mr. **KELLER**. Growing in hills is all right when you have not too many under cultivation. When you have a large area under cultivation, it is too much trouble and expense to thin them out. I have had good crops of Sharpless, but generally Wilson's Albany has paid better than any other. Have tried Jucunda, De Gand, Monarch of the West, Agriculturist, Springdale, and Cumberland, and have abandoned all of them, and confine myself chiefly to Wilson. Have a seedling of my own, a cross between Wilson and Monarch of the West. The berry is not as large as the Sharpless, but as large as any of the rest named, sweet, color light red, carries well to market, and not liable to scald in the sun like Wilson's. I expect to introduce it next season.

Mr. **SATTERTHWAIT**. Last winter was remarkable, being one of the severest ever known, yet raspberries and blackberries were injured less than during milder winters. Peaches are usually killed by severe cold, but the tender plants are more liable to injury by mild, changeable winters, which force them into a growing state. Along the Hudson river last winter, the Hudson River Antwerp came through all right.

Mr. **BISSELL**. Along the northern shore of Lake Superior, red raspberries are the most productive, and are never injured by the cold. Winter usually sets in in October, and lasts until May.

Mr. Keller. Has any one had experience with Wilson blackberry? With me they freeze down almost every winter. Probably the weather is too changeable. Extreme cold is not so bad as a sudden thaw.

Mr. Meehan. Ever since our Society was organized, we have had frequent reports about raspberries and blackberries being hardy in some places and not in others. I have always contended that in most instances of this kind, there has been something wrong in their management. The raspberry is a native of our northern climates. On Mount Washington, the sides of the hills are covered with canes, and I have gathered the fruit in Canada, where the winters are extremely cold. Foreign varieties are natives of just as cold climates as our own, and there is no reason why they should not be equally hardy. The raspberry is subject to four or five kinds of mildew, and to various insect enemies that attack and destroy its foliage, and it becomes a prey to cold winds, and is easily killed. One of these insects is closely allied to the *Phylloxera*, and attacks its fibrous roots with small lumps or excrescences resembling grains of rye. I think we can safely assume, when the raspberry dies in winter, that it is caused by some insect or disease that attacks and makes it tender, and that we must look to that source for the cause and remedy.

Mr. Satterthwait. Mr. Meehan's experience in this matter does not accord with my own. Have observed that in mild winters raspberries are usually killed. In regard to peaches, I see that Mr. Hiller, in his report, says they, as a rule, do best on high ground. Does that accord with the experience of others?

Mr. Engle. It has been my experience for years, and has been verified the past season, that mountain tops are more certain for peaches and other fruits. Where I live, in Lancaster county, there were no peaches for miles the past summer, but just across the Susquehanna, on the top of the mountain, trees were loaded. I have invariably found that where peach orchards were on high altitudes they had regular crops of fine fruit.

Mr. Satterthwait. I have no very high nor very low ground. It may vary twenty to thirty feet from highest to lowest. My location is about two hundred feet above tide water. I have noticed, also, that older trees withstood cold better and were more fruitful than the younger ones. Trees eight or ten years old were full while younger ones had few or none.

Mr. Hepler. I had but few trees and very little fruit the past season. I noticed, however, that trees on a northern exposure, where it was eight or ten degrees colder, had fruit, while on a southern exposure, where protected, there was none.

Mr. Sherfy. In an orchard of ten acres had one peach last season, and that was where a branch was covered and protected by snow. On the hillsides, where trees were well exposed, there was a clever crop.

Mr. Lint. Have had experience similar to Mr. Engle. In the past fifteen or twenty years when, in cold winters, our peaches were not injured they were on elevated ground.

Mr. Woods. The past summer the only peaches brought to the Harrisburg market were from elevated sites in York county. There were, also, some in lots in the city, perhaps owing to protection.

Mr. Satterthwait. In the low ground the cold is more intense. I had the best crop of peaches the past season in the State, and am not on high ground.

Mr. Meehan. I think elevation has little to do with the certainty of a crop. I have only a few trees, one or so of a kind, and had a fair crop, not one hundred feet above tide water. I saw many instances in Ohio, Tennessee, Georgia, and Alabama where full crops were had on high and low grounds. I was on Doctor Warder's place, twenty or thirty miles above Cincinnati, and not over seventy or eighty feet above the river, and, while most of his trees had no fruit, one or two trees were loaded. I attributed this difference to healthier trees and a higher condition of vitality. In northern Kentucky I noticed instances where trees were green and apparently in good health, but saw scarcely any fruit. Further down, in Tennessee, and not much above the level of the river, trees that seemed less thrifty and healthy were often full of fruit. On the top of Lookout mountain, twelve hundred feet above the river, trees had no fruit; lower down they were found bearing abundantly, while still lower they also failed. I think trees with good vital powers are more likely to bear a crop than weaker ones. My own trees are not cultivated but grown in grass which protects the roots from the sun, keeping them cool and not so likely to be destroyed by extremes and sudden changes.

Mr. SHERFY. The surest way is to find where trees do well naturally. In our neighborhood, on red land, trees will be frozen, and on other soil will do well. There are always many influences that are not considered and that modify existing conditions.

Mr. HOOPES moved that a committee of three be appointed by the chair to nominate officers for the ensuing year, and to report at the evening session. Adopted.

The following essay was then read by the Secretary:

THE MANAGEMENT OF AN ORCHARD.

By J. H. FUNK, *Boyertown*, *Berks county.*

The subject upon which I have been requested to write is one of such vital importance that it is with diffidence I present my views before this Society. I have no new discoveries to present. My success has been mainly due to paying strict attention to the following:

First. Location.
Second. Selection of soil.
Third. Its preparation.
Fourth. Selection of varieties.
Fifth. Proper planting.
Sixth. Judicious pruning.
Seventh. Good judgment, close attention, and a great deal of labor.

I will treat of these in the order in which they stand, and I prefer giving them just as I have treated my orchard, which I planted a few years since, the same for which the committee appointed by the Berks County Agricultural Society awarded the premium as the best regulated orchard in the county of Berks.

Location.

Under this head comes the exposure. In my orchard I have every exposure; protected on all sides by low mountain ranges, except the north-west, which opens into a narrow valley, and through which the north-west wind has a clear sweep over a portion of the orchard. My choice would be a northern exposure, protected on the north and west by mountain or forest. Trees thus located are less endangered by late frost.

Selection of Soil.

This is one of the most important considerations in planting an orchard. Be not governed by price. Better pay $300 per acre for good, suitable land, than take indifferent soil as a gift. In the first it will be pleasure and profit; in the other, disappointment and loss.

In describing my soil, I have sand loam, loam, and clay loam. The loams are to a depth of from two to four feet. We then come to a stratum of micaceous deposit, averaging from four to twenty feet in depth; beneath this a soft rock strongly impregnated with iron and small veins of plumbago. The clay loam is underlaid with a light clay sub-soil which never breaks. Were I again to make a selection, I would take the same, if obtainable. All these different soils are not equally good for any one variety of fruit, but each superior for such varieties adapted to it. I have my peach and cherry on my lightest soil. Apple on the loam. Pear, plum, and quince on the clay loam.

Its Preparation.

When I purchased this tract the soil was completely exhausted, being farmed continually, and for twenty years receiving no manure. I reversed the usual mode of farming. Instead of plowing a furrow five inches deep and fifteen inches wide, I put in a strong team and plowed a furrow but eight inches in width and fifteen inches deep, thus throwing up and intermixing ten inches of sub-soil with the exhausted surface. I then spread seventy-five bushels of good lime to the acre, and left it lay thus over winter. The following spring I applied five hundred pounds best dissolved bones to the acre, plowed shallow, harrowed well, and considered it in good condition to plant.

Selection of Varieties.

On this depends, to a great extent, whether your orchard will be a profit or a loss. The best guide is to select such varieties as do well in your own immediate neighborhood. Do not be tempted by fine, showy plates of fruit you know nothing about. If you are not acquainted, ask some one on whom you can rely, who has had experience. Do not plant too many varieties. Select as near as you can trees that are good growers and annual bearers of showy, good flavored, and good keeping fruit. My selection would be, in the order named, Grimes' Golden, Hubbertston Nonsuch, Krauser, Cole, Hays' Winter, Smith's Cider, Ben Davis, Falawater, Westfield Seek-no-Farther, for winter; Maiden's Blush and Duchess of Oldenburg, for fall; Red Astrachan and Early Harvest, for summer. Many may ask why I have omitted the Baldwin, Rhode Island Greening, Roxburry, Russet, &c. My reply is, I can buy them cheaper than I can raise them, and if I have plenty of such apples as Grimes' Golden Pippin, others are welcome to Baldwins, &c. Of pears, Duchess, DeAngouleme, (dwarf,) Bartlett, Beurre de Anjou, Seckel, and Louise Bonne de Jersey, (standard.) Plums, German, Prune, Imperial Gage, and Lombard. Quinces, Orange and Rea's Mammoth. Cherries, Early Richmond, Mayduke, Black Tartarian, and Governor Wood. I never plant large trees, preferring two years old of stocky growth; peaches, one year old.

Proper Planting.

Have the holes dug large, not less than two and a half feet square, and eighteen to twenty inches deep. When ready for planting throw the surface soil in below, filling the hole to such a height, keeping the center slightly convex, that when the tree is set in the roots take their natural position and leave the tree, when planted, nearly the same depth as it stood in the nursery row. Trim off all mutilated roots, and set the tree in place, spreading all the roots out evenly; throw on some loose, mellow ground, filling up all vacant places around the roots. When sufficiently covered press the earth gently but firmly to the roots with the foot, then finish filling the hole. When young, thrifty trees are thus planted, they need no stakes. I have planted three thousand trees in my orchard and have never staked one, and I have scarcely a half dozen crooked trees on the place. After planting it is very beneficial to mulch with any loose material, long manure, straw, weeds, leaves, tan bark, or even coal ashes; anything that will retain moisture and keep the ground loose. This is more necessary in sod than in cultivated ground, where the loose surface soil acts as a mulch.

Judicious Pruning.

Here considerable good judgment is necessary. First know for what you are pruning; do not lop limbs indiscriminately. There are several objects to be obtained by pruning. First we prune a young tree when planting, to assist nature and relieve her from overdue exhaustion; for when a tree is dug up the greater part of the fine rootlets are cut off, thus diminishing the supply of nourishment by cutting off from one half to two thirds of the last year's growth. You relieve the tree of that much material to supply with food, and you do more. By careful pruning at the proper buds you start the foundation for a *low round symmetrical top*. By proper pruning you can keep up a good, thrifty growth. For this always prune in early spring, and if the work be properly done the tree will need but little pruning in after years.

Good Judgment, Close Attention, and a great deal of Work.

We now come to a question that has caused more contention than any other in the management of an orchard. Cultivation or non-cultivation. I adopted the following plan, and have been so well pleased with the result, that I should follow the same course, were I to plant another orchard: I planted my young orchard the first year with potatoes and corn. The trees all made a good growth except fourteen cherry, and fifteen peach. Apple, pear, &c., all grew fine. The second year I applied good, strong manure, twenty tons to the acre, and again planted corn and potatoes, adding superphosphate of lime to the hill. The result was a good crop of potatoes and corn, and an enormous growth in the trees, excepting three acres, which I put in sod. These trees made a very meager growth, although they received the same application of fertilizer. The third year I plowed the fallow ground again, applied five hundred pounds phosphate of lime per acre, planted corn and potatoes. The result this year was very marked. The trees occupying the cultivated ground, made a strong healthy growth, while those standing in sod made a very small growth. The contrast between the two was so marked as to be seen at a distance. This was the year the committee visited the orchard. They all noticed the marked contrast between them. Fourth year I plowed under a heavy coat of manure; also, turned under the sod around two tree rows, planted potatoes. Result, a fine crop of cherries, a heavy crop of peaches, and a great many apples, and a strong growth from the trees under cultivation, none from those in the sod, but the two rows which had the sod turned under made an enormous growth, leaving those continuing in sod far behind. Fifth year, run the cherry block in sod, cultivated the peach, apple, pear, &c., without crop. Result, less growth in cherry, but a heavy crop, the apple and pear continued their strong growth under cultivation, and bore heavily, some as much as half a bushel to the tree. The peach also grew enormous, but bore no fruit, owing to the buds being winter killed. This year the trees in sod made a better growth than any year since cultivation was stopped. I have measured several of the apple trees, under cultivation now five years, and they average four to five inches in diameter, are fifteen to sixteen feet high, and have a spread of ten to twelve feet, with heads nearly to the ground. My plan would be to cultivate a young orchard for eight to ten years, then run into sod, and top dress, mowing the grass and leaving it decay on the ground. But this is not all. Eternal vigilance must be the watchword of the successful orchardist. I wash my trees every spring with a wash, one pound of caustic potash to five gallons of water, washing with a stiff hand-scrub. This keeps the bark clean, smooth and healthy, destroying thousands of insects. At the same time potash is a very necessary ingredient to all vegetable matter. It is also very necessary to examine for the borer at least twice a year. During winter is a good time to destroy thousands of eggs of such insects as infest the tops. They can then be readily seen, gathered, and destroyed.

It is useless for a lazy or indifferent man to endeavor to be a successful fruit raiser. He must take pride in his work; he must apply himself to work, not entrusting it to others. Nor is the exercise of muscle alone necessary. The mind must be brought into action; he must devote a portion of his time to reading the various works relating to his business, as well as good horticultural papers, thereby becoming familiar with the causes of failure or success of others, learning how to avoid the first, and benefit by the latter. With these remarks I will close. If what little I have said will help any one in any particular, I am amply repaid.

Mr. **Woods.** What about Hays' Winter? Is it not Red Streak? It is a large uniform apple, but rather a fall variety.

Mr. **Hoopes.** It is now called Hays' or Wine by Mr. Downing. It is a miserably poor grower in the nursery.

Mr. **Longsdorf.** What are the hanging qualities of Grimes' Golden?

Mr. **Shimer.** It drops badly with me.

Mr. L. S. **Reist.** With me Hubbardston drops badly, and is of no account.

Mr. **Satterthwait.** Baldwin is of no account in our county. It bears abundantly, but always rots.

Mr. **Kepler.** I have a dozen Baldwin trees, and would plant more if I had room.

Mr. **Morris.** In Susquehanna county Baldwin is our best apple. Have barrels of them in my cellar now waiting to get ripe.

Mr. **Engle.** We must conclude that each one choose varieties for himself. I am more favorably inclined to Baldwin now than formerly. On the same elevation with the peach orchard of which I spoke, it did well, as did also Hubbardston, Rambo, Smokehouse, and York Imperial. They were loaded to the ground, and had to be thinned to relieve the trees. They are keeping well, though Hubbardston is keeping better than Baldwin. Esopus Spitzenburg never grown to any extent. Newtown Pippin bears occasionally, perhaps once in five or six years a full crop.

Mr. **Longsdorf.** In the Cumberland valley we rarely get half a crop of Baldwins. Two hundred miles south of us, in the Peidmont valley of Virginia, I saw last fall the finest Baldwins I ever saw grown, and they were fully two thousand feet above tide water. They are very perfect and keep well. I have here a collection of Virginia apples. There are two specimens of Newtown or Albemarle Pippin, one from old trees from graft from Albemarle county, the other from young trees, but don't know where from. They differ much in appearance. The soil is clay impregnated with iron and copper.

Mr. **Bissell.** The original Baldwin tree still stands in Massachusetts. I had the pleasure of seeing it a few years ago.

Mr. **Eby** asked Mr. Engle whether his trees were not protected by timber.

Mr. **Engle.** They are partly surrounded but not protected by timber.

Mr. **Longsdorf.** The orchard which had the fine Baldwins to which I referred, stood on the top of a mountain, and was protected on the east and west by timber. On the north it was open, and a little timber on the south. Other orchards in the vicinity had different exposures.

Mr. **Lint.** In the section in which Mr. Engle's orchard is located, fruit was plenty the past year. From the Susquehanna up the valley toward York, trees generally had as many apples as they could bear.

Mr. **Sheller.** In Union and Northumberland counties Baldwin has not come up to expectations. The cold winter of eight or nine years ago injured many trees that have not borne since. I have planted a number of this variety, but have no fruit yet. Grimes' Golden I have fruited, and have a few bushels in cellar now. They fall rather early, but hope they will do better as trees get older.

Mr. **Pannebaker.** I planted King of Tompkins County ten years ago, but they did no good.

Mr. **Balderston.** It does not do well in New York, where it originated.

Mr. **Sharpless.** With me it is a failure; Baldwin also drops badly.

Mr. **Satterthwait.** My apples are keeping better than usual this year. Have Smokehouse in good condition yet. Some that are usually considered fall varieties are also keeping well.

Mr. **Lint.** Some varieties that do not usually keep well, do better when grown in a dry season.

The following essay was then read:

HORTICULTURE FOR PLEASURE.

By Calvin Cooper, *Bird-in-Hand, Lancaster county.*

Mr. **President**: You have had "Horticulture for Profit," and discussed the subject in almost every form; as well the bright, and also the "Dark Side of Fruit Culture." But I have not observed that any of your contributors have spoken of horticulture for pleasure. Notwithstanding the trials, disappointments, vexations, and discouragements that every season brings, there is nevertheless a charm connected with the occupation, that we all embrace for the love of it, to a greater or lesser extent.

How do plants grow, is a query that meets us in the beginning, and is a problem that cannot be solved. The spontaneous action of the plant, the self-determined shapes it assumes, its vitality, are subjects for thought beyond the conception of the most learned botanist. Is it not a direct emanation from the Supreme Will, the fountain of all life?

Vegetation is doubtless the lower order of life. It springs directly from inorganic matter, and is the first step in the formation of plant life. To see the tender germ as it peeps through the earth, a real thing of life, and watch its developments from day to day, has a fascination for all who have an eye for the beautiful. How many of us pause to think of the transformation taking place, when we drop the little seeds in the bed, (some of them so diminutive as to be almost invisible,) and in a few days find a living plant ready to battle with the enemies of vegetable life. Its progress day after day is a food for thought that the learned and the most ignorant may embrace, and yet be unable to conceive from whence the matter is brought for its development.

I propose in the few remarks I shall make, to take the bright side of horticulture. Did we always weigh the cost, and take into consideration the trials of every undertaking, few would launch out into the sea of experiments, and new plants and new ideas would then be the exception. Our life, our joys, are in part derived from horticulture.

I believe a large proportion of those who plant do it as much for amusement, comfort, and home adornment, as they do for profit. One of the first requisites of a home are trees and plants to diversify the appearance, and add comfort and attraction acquired in no other way. How welcome is the shade of a well-formed cherry tree on a hot summer's day. Then, too, its fruit (if the robins have not been there first) will add food as well as drink, while the husbandman tarries beneath its branches.

Well do I remember the favorite tree selected by the harvest hands at the old homestead, under which they took their noonday rest. This was a fine large "Robert's Red Heart" cherry, planted in front of the house, with shapely top and spreading branches, adding a charm to the spot during the whole summer. The planting, training, and care of which was all the work of a fond mother, now peacefully resting in a home that knows no waking.

Then, too, the quick growing peach, with its bright luxurious foliage, soon fills a vacant spot that well repays the trifling cost, labor, and time required to make a tree We will not pass the plum and apricot, for here is a little nook and there a recess that needs filling. Then, too, they might furnish a few "curculio" for the fowls of the yard while they are in search for the early worm.

The apple, too, has its claims, with broad spreading branches inviting comfort to its cooling shade as the yeoman (as well as his stock) pass in their routine to and from the toils of the day. All this usually is a work of love, and their training to recreate during the hours of leisure, affords an amusement that diverts rather than tires. The cutting out of a branch here and there, and shortening another that is likely to outgrow the rest, and the observation of the habits and growth, will afford food for thought, always pleasing, and of a tendency to quiet the nerves and strengthen the body for the duties of the hour.

And should an occasional crop of cherries, peaches, plums, apricots, apples, &c., be the fruit of our labor, we are doubly paid. First, by the attractive appearance given to the home, and the pleasure derived by the cooling influence of the shade during the hot summer months. And also the deliciously flavored fruit, with its health-giving properties, contribute wonderfully towards supplying the household with the daily requisites to sustain life.

Mark the busy merchant, with his modern suburban home, how he delights in the attractions of his handsome well kept grounds, as he meanders from bush to plant, here and there training a vine or tree to suit his cultivated taste, and varying the systematically laid out grounds, adding a charm to the spot to divert his thoughts from the perplexing trials of his business hours. This surely is not a work of necessity nor profit, for those who know will say it is quite a drain on the purse, according to the magnitude of the grounds. Such is the fascination connected with the planting and training, that the labor and care is rather a work of amusement, because of its pleasing attractions, and its power to divert rather than tire an over-worked brain.

The industrious mechanic, too, has taken the infatuation, and often found during his leisure hours in beautifying his home with beautious gifts, the plants of the earth. Who but will halt and admire in passing a handsomely laid out yard, with its gorgeous beds of bloom. interspersed with choice shrubs and trees, and the well kept walks with gentle curves leading now to a shady nook, thence by a beautiful border of variegated foliage plants, and not give a praise of gratitude to the Giver of all good works.

In conclusion, I cannot but affirm there is a charm, an attraction, a fascination in the work of the horticulturist, that will far overbalance the labor connected therewith, and supply a heartfelt recreation to all who will embrace it. The *comparison* of the wonderful works of nature, are sufficient of themselves to awaken thoughts of praise. Instance, if you will, the stately oak with its spreading branches, and the erect form of the Lombardy poplar. The weeping willow, with its ever pendant branches, and the pyramidal form of a sugar maple. The uncouth weeping ash, and the symmetrical form of the European larch. The graceful birch, and the straggling catalpa. The giant form of the common poplar, and the trailing kilmarnock, and yet all spring from a tender germ, and assume the form common to its kind. The power of the tree to reproduce itself, is even more forcibly shown in fruits. Top-graft an apple, and though there may be as many varieties as there are limbs on the tree, each will produce its color, red, yellow, and striped, and in flavor its peculiar taste, acid, sub-acid, or sweet, and yet all is supplied from the same root. The floral kingdom has its endless attractions in the various forms of its plants. The beautiful and harmonious blending of the foliage and flowers, ever has its charms for old and young, the nobleman and his servant, the princely aristocrat and the lowest menial, all pause to admire the wonderous productions of the vegetable kingdom.

After fixing seven o'clock for the evening session, and half-past eight for morning, the Association adjourned.

EVENING SESSION.

The meeting being called to order, Mr. Meehan, of the committee to nominate candidates for the various offices, for the ensuing year, submitted the following:

President—GEORGE D. STITZEL, Reading.
Vice Presidents—H. M. ENGLE, Marietta.
JOSIAH HOOPES, West Chester.
W. S. BISSEL, Pittsburgh.
Recording Secretary—E. B. ENGLE, Marietta.
Corresponding Secretary—W. P. Brinton, Christiana.
Treasurer—GEORGE B. THOMAS, West Chester.
Professor of Botany—THOMAS MEEHAN, Germantown.
Professor of Entomology—S. S. RATHVON, Lancaster.
Professor of Horticultural Chemistry—S. B. HEIGES, York,

On motion, the Secretary was authorized to cast the ballot of the Society, and the aforenamed were declared elected.

Mr. HOOPES, of the committee to prepare further business for the consideration of the Association, submitted the following list of

TOPICS FOR DISCUSSION.

1st. Can we not find a stock upon which the apple may be grafted, or budded, that will prove "borer-proof?"

2d. What are the better methods of cultivating strawberries to promote fruitfulness?
3d. What is the true cause of "cherry-rot?"
4th. Why are the newer varieties of grapes not more abundant in our markets? and why has not the Concord been supplanted?
5th. What are the really good and reliable late winter pears?
6th. Have any of the varieties of peach ripening before the Hale's Early proved exempt from rot?
7th. What are the most beautiful and reliable ornamental trees for small yards, confining the list to six deciduous and three evergreens? Also, what are the best twelve shrubs?
8th. What are the best methods of constructing a cheap, substantial, and handsome walk for our home-grounds?
9th. What soils are the best adapted for the growth of the apple?
10th. What varieties of vegetables have been found most profitable for market?

Mr. ENGLE. In submitting these questions for discussion, the committee wish it understood that the idea is not to preclude any of the other business on the printed programme. The essays which have been prepared should take precedence, and these topics have been suggested merely to have business on hand after the regular list has been gone through.

President STITZEL then read the following annual address:

Few are aware of the great advantages derived from the free discussion of the various merits and demerits of new varieties of fruits, new processes of cultivation, new fertilizers, new methods of curing the diseases of trees and plants, and protecting them from their natural enemies, new methods of storing and preserving fruit, of the preparation of the soil for our orchards, and the effect of location, of the effect of the climate upon new introductions, and a host of other points that must be thoroughly understood by the successful fruit grower. The accumulated experience of devoted practitioners saves for new experimenters immense delay and expense, and if the scattered information contained in our annual reports could be carefully compiled and published in the form of a guide-book, it would furnish for Pennsylvania the best fruit growers' companion in existence. I have repeatedly brought this matter to the attention of the Society, and I trust the suggestion will some day meet with approval. The advance that has been made in the production of fruits gives us the greatest cause for encouragement and perseverence. The varieties of apples, pears, peaches, plums, grapes, and berries that were nearest perfection when our Association was first organized, in 1860, have been already discarded as unfit for cultivation, while among the new varieties it is certain that the spirit of improvement will make some headway.

Experimenting in Crossing Fruit.

Seedlings and hybrids of endless varieties are intelligently and thoroughly tested, and science has joined hands with faithful labor in improving the varieties of fruits that minister so much to our health and enjoyment. President Wilder, in his annual address before the American Pomological Society, in Boston, last September, in speaking of the necessity for more experiments in crossing fruits, said: "Nature has in her laboratory infinite stores of the same elements that have produced our finest fruits, and we have only to knock at her portals and pronounce the *sesame*, when she will open up to us the secrets of her wonder-working power." Constant, careful experiments, repeated under varying circumstances, will disclose the hidden riches of nature, and give to those who have an appreciation of real worth a greater source of pleasure than her mines of gold and rivers of diamonds. The crab apple of early days will not bear a favorable comparison with the Baldwins, Bellefleurs, and Pippins of our time, and yet these must trace their genealogy back to such sturdy ancestry. The luscious Bartlett, Seckel, and recently famous Kieffer pear, must own their origin in the little, sour, prickly hedge pear, that puckered worse than our present persimmon. One can hardly believe that the bitter almond had any affinity with the Morris Whites, Old Mixons, and Crawfords of to-day; and so with our plums, grapes, and berries—their present perfection is the result of great study and intelligent experiment. What has been done can yet be done, for their is still room for improvement. What can be accomplished with our neglected quince, the uncertain apricot, the papaw, or even the persimmon, is still within the field of reasonable development by reason of intelligently directed experiments.

The Pleasures of Pomological Study.

No field of nature offers more enticements for the scientist or student of natural history. Do we realize this fact sufficiently? Are we not inclined to devote our attention too exclusively to other sources of pleasure and profit? Too much neglect the very highest and noblest employment in which we could engage? Certainly he who can hold such familiar converse with nature, and can understand her mystic language, and compel her to produce something that was hitherto unknown, must find an unspeakable pleasure in that alone; besides, he adds to the gratification and happiness of his fellow-man. One thing is certainly true, that a new impetus has been given to the important business of fruit culture. The successful experiments in hybridizing have attracted increased attention, and it is possible that with the favorable influence of other fruit growers' associations throughout this country, our National Department of Agriculture—alas! there is no Department of Horticulture or Pomology—may find it a sensible thing to establish an institute where these experiments may be made under scientific scrutiny, and where the patient delays and frequent failures may not fall so heavily as they now do upon the individual. As great beneficial results would certainly follow as attend the department's present experiments in introducing foreign cereals and plants, the attempt at growing tea for instance, &c.

Further Improvements Possible.

It must not be supposed therefore that there is no possible improvement to be made upon our present varieties. Meanwhile it is just as important that we do the best we can with the varieties we have, for even with new and better kinds, unless we thoroughly understand their care and cultivation we can find but little satisfaction. We know of many orchards of well selected trees, that are almost wholly worthless because of the carelessness or ignorance of their owners. Trees are crowded too close; if pruned at all the trees are almost ruined by indifferent cutting. Insects are allowed to secure such foothold that their ravages cannot be stopped—the owner wonders why he can get no fruit, because indifferent, declares fruit raising a failure, takes no stock in fruit growers' societies, and allows his orchard to run to ruin and early decay.

Hints Concerning Apple Orchards.

Not over forty apple trees should be expected to thrive and come to prime bearing condition upon a acre of ground. The soil should be well cultivated, mulched, and manured, and the trees when young need constant attention and protection from cattle, from mice, rabbits, and insects. Sappers and suckers, that take away the sustenance from the tree proper, should be cut off while it can be done without disfiguration, and here and there a branch may be removed to add to the strength and symmetry of the tree without doing it any injury. Meanwhile your orchard can be cultivated. The trees will soon begin to do without much attention, excepting the removal of insects, losening of the soil about the roots, and probably an alkali wash occasionally. There is intense satisfaction in watching the growth of your orchards under such conditions, and what more pleasant sight is there to the fruit grower than to see them covered with fragrant blossoms, that under favorable circumstances will develop into elegant fruit?

Necessity of Planting Trees.

There are circumstances over which the fruit-grower has no control, that may prevent the realization of his fond anticipations. Cold rains and sleet in the blossoming season may remove the pollen and destroy the incipient fruit, or some eccentricity of the atmosphere may occasionally spoil the crop, but these are exceptional. Ordinarily, if the location of your orchard has been wisely selected, the soil properly cultivated, and the trees carefully attended to, you will have a crop of fruit that will richly repay you for all your care and labor and patient watching. Besides being one of the highest sources of health as article of food, when their flavor and condition are perfect, fruits are among the luxuries of life, and the study of their growth and propagation exercises a refining influence upon the farmer and his family. Every landowner should plant trees liberally—fruit trees in orchards and along his inside fence rows, ornamental trees in and around his yard and along the lanes and public roads. Nothing can bring him more profit at such little outlay, and nothing else add so much to the market value of his premises.

Most Profitable Fruits.

I might add a word as to the kinds of fruit which, according to my observation, yield the most general profit throughout the State. The apple must be accorded the first place in the list. A good apple orchard will be an annual source of profit to its owner, and now, since the construction of our modern fruit-houses has solved the problem of keeping them sound and in good condition until almost the following season, there is every inducement for extending their cultivation. The time has gone by when our Pennsylvania markets will afford an opportunity to those handling western apples to demand the enormous prices of former years, for we can store our product for consumption as the demand is felt. It is possible that our climate is not as favorable for this kind of fruit raising as that of Canada, Michigan, Iowa, Minnesota, and the region of the north-west, but we have certainly found some varieties of apples that are adapted to our climate, and we hope to see their product increased a hundred fold. Even in the country right around us there are plenty of splendid farms, where the whole dependence of the occupants for apples lies upon a few old worm-eaten trees that their grandfathers planted years and years ago. These bear a few knotty worm-eaten specimens every three or five years. These people buy their apples in the market. Can no argument effect a reform among them? Soon these old trees must give way and be removed as an incumbrance to the ground, and make room for tobacco or some other crop that pays immediately.

Object of the Pomological Society.

It is our object not only to tell this class of people how to plant trees, when and where to plant them, and how to take care of them—but if possible, to do something to arouse a spirit of enterprise or emulation among them and get them at it. The offering of premiums and tender of exemption from taxation and other methods resorted to as in new countries, does not seem to effect the object. There is no way so effectual as to demonstrate to them that there is great profit in it. Are we not able to do that? We must do everything we can to awaken renewed interest in this subject.

Cultivation of Pears.

Passing from fruit growing generally, and apple raising in particular, I want to mention other varieties of value to the farmer. Every farmer should have a few pear trees on his premises. This luscious fruit is attracting more and more attention in this State. The tree does well where protected. Around buildings it seems to rarely fail in bearing, and always keeps in good condition. Even in built up cities, almost every lot is big enough to grow a pear tree, and the satisfaction the owner and his family derive from its fruit greatly exceeds the market value of its product. In orchards, however, very few of the many varieties can be cultivated with the regular profit that attends apple raising. The trouble is principally because of the perishability of the fruit. If the location is such as to afford a ready market, I think probably a more extensive cultivation might be made. The trees will permit of closer planting than apple trees. One hundred may be safely planted on an acre. One hundred prime bearers ought to produce three hundred bushels of fruit, and if these can be readily marketed as a mere matter of profit, it ought to attract more attention than it does, for the land of the orchard is not wholly useless for other farming purposes. Select your trees from your reliable home nurseries, and reject all varieties that will not bear handling, for the fruit when removed from fruit houses, soon commences to decay.

Peach Trees.

The peach in Pennsylvania may become a reliable crop, but our climate does not suit it well. Here and there we may find a successful grower. The experiment is not an expensive one, for it does not take long for the trees to grow up and come to perfection. This delicious fruit always finds a ready market, and if the harder varieties, suitable for orchard culture can be found to adapt themselves to our climate, and at the same time retain their excellent qualities, they will be found exceedingly profitable. Everybody who controls even but a few perches of ground, should grow a peach tree. They grow easily and rapidly, and if the variety does not suit you, cut it down and plant another. One hundred and fifty trees to the acre will do finely.

Varieties of Cherries.

Cherries, too, are easily grown, and their fruiting season comes just when everybody has an appetite for fruit, before the market affords much in this line. This makes them acceptable, and their cultivation is a consideration for every household. In planting cherry trees, a few of each of the early, medium, and late varieties should be selected. Cherry orchards will not permit of much cultivation; fence rows and areas about buildings will be found to be the most reliable location for the trees.

Grapes and Wine Making.

The grape which has already assumed a most important place in pomology in this country, is striding rapidly into the foremost position as a favorite with the fruit grower. Thousands of tons are shipped into our cities and towns, and the yield is constantly increasing. The wonderful improvement that has been made in this fruit since the time when we were content with the fox and frost grape, is almost indiscribable. So long as people will have their wine, (and the business of its manufacture is rapidly being better understood by Americans, so as to compete in quality with importations,) so long will the extraordinarily large profits from grape culture continue. It is believed by many, that our grapes now produced are superior to those from which the famous wines are made, and that American wines are so improving in quality as to find a market in Germany, and even in sunny France.

Quince, Plum, and smaller Fruits.

For some reason the quince and plum have fallen into disfavor. Can we do anything to increase the interest in the cultivation of these important fruits? Can we do anything that may improve their quality? The smaller fruits have so much improved from cultivation that it seems possible to produce something palatable from every fruit of tree, plant, or vine. Science has performed wonders with the strawberry, raspberry, blackberry, and currant, and these have become most delicious requisites for our table. Then there is the cranberry. Why do we let New Jersey raise so large a proportion of the whole market supply? We have thousands of acres of sandy marshy lands in our State, that now do not produce enough to pay the taxes, that could be readily flooded and adapted to the growth of that profitable berry, and which land is unfit for other agricultural or horticultural purposes. Can we not do something to arouse an interest in the cultivation of the cranberry and convert the snipe ground of the early spring sportsman into something more inviting and profitable?

Rapid Strides in Pomological Knowledge.

When I see the great advance that has been made in fruit culture, and reflect that many of the improvements and much of the impetus that has been given to the business came from the discussions, deliberations, and investigations of this Association, I feel encouraged to every effort to keep alive the flame of enterprise, and to promote, encourage, and regulate, as far as we can, the cultivation of these things that do so much for the health, welfare, and enjoyment of mankind. We have no selfish object in meeting here. Our individual objects might be best subserved by retaining to ourselves the knowledge of any discoveries of benefit we may have made, but we would impart to all who are in sympathy with our purpose whatever information we may have on the subject, and if in any way our assembling together shall incite new interest in the cultivation of fruits we shall feel amply repaid.

Increasing Interest in the Affairs of the Society.

The science of agriculture alone has forced itself into deserved recognition, and we are glad that increased interest is manifested by the State in the object of our Society. My suggestion of a year ago that a State fair should be held under our auspices, will, I hope, some time receive favorable action. Nothing would go further in the way of a practical demonstration of the advancement that has resulted from intelligent and earnest study and discussion. Our thanks are especially due the Pennsylvania Agricultural Society for many kindnesses extended to us. It has been our desire to be represented at their annual fair and to make a society exhibit there. And this would have been done had not other exigencies of the agricultural society prevented their holding their fair at some central place, as was intended. Unless it shall be the opinion of our members that a fair under our own auspices would do more to increase our influence and usefulness, the practice of making an exhibit as a Society, at the fairs of the State association, should be continued. Whatever shall tend to increase the usefulness of our organization and promote the purpose that first compelled us to come together shall always receive my hearty coöperation.

The following essay, by H. M. **ENGLE**, was then read:

RAISING SEEDLING FRUITS.

This question may be answered in a general way in a few words, viz: Sow seeds and raise plants, shrubs, vines, and trees. And further, does not nature attend to this matter without the aid of man? Are not a large proportion, if not the largest, of the most valuable fruits accidental seedlings?

Credit where Credit is Due.

I will not, for a moment, dispute the said assertion, but at the same time I hold that many valuable varieties of fruits are the result of seeds planted by the hand of man, for which he has received no credit.

Many trees have been planted throughout our country since its settlement, by missionaries, travelers, and others, the result of which we can form no accurate estimate. Within the last quarter of a century, however, many new fruits have been produced by more intelligent methods, viz: by hybridization and by cross fertilization by design, which have produced the most gratifying results. We must be surprised at the result.

New Varieties of Grapes.

With the grape, greater success has been attained than with any other kind of fruit. Of the value of grapes produced by design, it is now impossible to estimate. When we compare the time when the Isabella and Catawba were the only popular grapes, with the present day, when scores of improved and superior varieties are being disseminated through the length and breadth of the land.

Thanks to Messrs. Rogers, Ricketts, Wiley, and others for the choice we may now make in our selection for planting. And from present indications we are just on the threshold of what we may expect, and, unless the future shall belie the past, this country will, in the near future, be enabled to claim as great a variety of fine native grapes as any other.

Minor Fruits.

The number of new and improved varieties of strawberries, raspberries, blackberries, cherries, pears, and other fruits have of late years been multiplied to such an extent, as to almost confuse the planter with limited room or means. This, however, should not deter any from raising new seedling fruits, as time and testing will eventually decide so as to lead to the "survival of the fittest." The venerable president of the American Pomological Society has in almost every annual address urged the production of new fruits by hybridization and cross fertilization, and is, in his advanced years, lending a helping hand in this laudable cause.

One of the Drawbacks.

The only serious drawback in the multiplication of new fruits, is the disposition to make too great a speculation of new things, and too many make extravagant claims for their pet products, and cling tenaciously to those claims, whether worthy or not, simply because it is their own production. May this, as well as other horticultural and pomological societies, be slow to recommend any new fruit or vegetable for general cultivation, unless thoroughly and extensively tested. No new fruit should be added to our catalogues, unless it has special merit not possessed by any already on the list.

Natural Methods of Reproduction.

But to the question. Prior to the formation of the flower and period of inflorescence, nature seems to work in the dark, but during and from this time until the fruit is perfected, her operations are intensely interesting to the close observer. Let us follow her progress in the development of the bud, the expansion of the corolla, the spreading of the petals, exhibiting the stamens and pistils—a perfect flower in all its beauty and fragrance. The most important parts, however, are the reproductive organs—the stamens and pistils; the former are termed male and the latter female organs. When the anther of the stamen is ripe it casts off its pollen in very minute particles, which falls upon the stigma of the pistil, which, when in a condition to receive the pollen is of a glutenous nature, to which the same adheres; thence it passes down through the style of the pistil into the ovary, when the fertilization is complete.

Some plants, shrubs, and trees have flowers purely staminate and others purely pistilate on the same plant or tree, while others have staminate flowers on one plant or tree and pistilate on the other. The latter are termed diœcious the former monœcious; but whatsoever the nature of the plant may be, unless the pollen reaches the ovary of the pistil, there can be no fertilization, and consequently no seed or fruit.

Variations in Seeds.

It is well known that seeds do not always produce the same fruit as their parent, showing that pollen is carried from other trees by insects or by the wind, or both.

It is not at all strange, therefore, that by planting seeds that have been fertilized by nature the chances will be few and far between of the seedling being superior to its parent, although such cases have occured. Stone fruits reproduced their kinds truly, more commonly than pip fruits.

The object in producing new varieties is to combine desirable qualities of both parents in the progeny, on the same principle on which stock breeders operate, and we must admit that they have more nearly attained their ideal in that particular than horticulturists have theirs.

The former, however, have followed their object practically for a longer period than the latter, who will, in my opinion, eventually, by judicious selection, breed out objectionable and breed in desirable qualities in fruit, as breeders of animals do in live stock. Let us not be surprised some day to hear of thoroughbred apples, pears, peaches, grapes, and other fruits; and that books of fruits, with their pedigrees, will be kept as well as herd books. The new and improved varieties of fruit produced by design by hybridization and cross-fertilization are too recent to prove the above assertions, for very few, if any, have been recrossed to test the theory of transmission.

Is it not reasonable that laws govern the vegetable kingdom which are as immutable as those that govern the animal kingdom, however limited our present knowledge of the subject may be?

Facts that Must be Inquired into.

In crossing a sweet fruit with an acid one, we would reasonably expect the new seedling to be sub-acid, but such will not certainly follow. It is, therefore, of the highest importance that those who propose to follow, or who are now following this very interesting business, should search diligently the laws which govern its processes in all its details.

For instance, the question may arise whether the more vigorous plant or tree will transmit more of its nature than the weaker one, or, what will be the effect of applying the pollen to the pistil as early as it can be made effective, or as late as the nature of the case will admit, or by applying the pollen in its earliest available condition to the stigma as late as it will admit, and *vice versa*; the results of applying the pollen by sunshine or under a cloud, the effect of wet or dry weather following fertilization, also, whether the application of fertilizers to the plant or tree while the fruits or young seedling are growing, will produce different results. Whether it will ever fall to the lot of man to fully understand the laws which govern this delicate process or not, one thing is reasonably certain, that by crossing two varieties of fruit of great excellence, the resulting fruit will be superior to the product of two inferior varieties. But how to obtain the qualities we may desire, by crossing, is yet a hidden mystery.

If, however, stockmen could breed off horns, and almost reach their ideal in breeding beef, milk, and butter strains into fixed types, may not fruit growers attain similar results in the vegetable kingdom by taking a thorough course in nature's school of experience?

But whatever we may achieve, our calling is a noble one, and, with what has been done in the past, and the progress being made at present, our future looks bright. Let us thank a Divine Providence that we were born in the nineteenth century!

The **PRESIDENT.** This is an interesting topic and should elicit some discussion.

Mr. **MEEHAN.** The paper just read leaves but little to say, and I cannot see why not more is done for horticulture by hybridization. We may improve our fruit if we do not succeed in obtaining new varieties. To Mr. Rogers' efforts in this direction we are indebted for the noted "Rogers' Hybrids." So also, to Mr. Ricketts and Mr. Allen are we indebted for many valuable hybrids that may come into general cultivation. We have also instances in other fruits, and there is no reason why the raspberry and blackberry may not be hybridized; also, the currant and gooseberry, and the apple and pear. I, myself, saw a pear which grew on a Greening apple tree, and which had the characteristics of the pear. It had seeds similar to the pear, and that peculiar grit which distinguishes the flesh of the pear from the apple, and the inference was clear that the change was due to hybridization when in bloom. The fruit was exhibited at the Academy of Natural Sciences, and these points were brought out during its examination. There is a wide field for investigation and experiment here, and it would amply repay some one who has time to devote to it.

A hybrid is the result of a union of two distinct species, while a "cross" is the union of two varieties of the same species. Thus by a blending of two varieties of strawberries or raspberries we obtain "crosses," while the result of crossing apple with pear, raspberry with blackberry, &c., is a "hybrid."

Mr. **RUPP.** Can hybrids be propagated from seeds?

Mr. **MEEHAN.** There is no reason why they should not grow. It was believed at one time that all hybrids are sterile, but a vast majority are just as fertile as other varieties. There is no reason why Rogers' Hybrids will not grow from seeds.

Mr. **RUPP.** The difficulty is in fixing a type that will be permanent. I find the hybrids and crosses in flowers always have a tendency to go back.

Mr. **ENGLE.** In my opinion types can be fixed in the vegetable as well as the animal kingdom. Some years ago I tried to hybridize the peach and apricot. I think the fertilization was done thoroughly, but the new seedlings were all peach, with no characteristics of the apricot. I believe, however, that by fertilizing again and again a type would have been fixed that would have been permanent.

Mr. HOOPES. When in Erfert, Germany, a few years ago, I was struck with the great success that has been attained in hybridizing the colors of Asters, Balsams, and other flowers. I learned that it required years to establish new and distinct types. Even if kept pure they would not come true in three or four or five years, but it required six years to set a distinct type in color. I was told there were men employed for years for this special purpose.

Mr. RUPP. In growing Primroses I have found them to go back, not merely to parent types, but fifteen or twenty generations.

Mr. HOOPES. We all know what a great influence the scion exerts upon the stock and *vice versa.* I noticed an instance one season in budding variegated mountain ash upon the common variety, that shoots coming out below the bud were variegated. In grafting apples Greening will make a few straggling roots, while Long Island Russet and other varieties always have fibrous roots.

Mr. CHASE. We know the Creveling grape is aided in its fertilization and rendered more fruitful by being planted among other varieties. On the same principle if trees with strong constitutions, sorts like Duchess of Oldenburg, or some of the crabs, should be planted among the weaker varieties, would they not be likely to aid or strengthen the fertilization of the weaker sorts, and thus insure better crops of fruit?

Mr. MEEHAN. There is a tendency in some varieties of fruits to have their reproductive organs on different flowers. This is characteristic of the Creveling grape, and a large number of its flowers are abortive, and, unless it gets pollen from other flowers, it will be imperfectly fertilized. Some seasons, also, grapes like Creveling, will have its stamens all right, and sometimes defective.

Mr. SATTERTHWAIT. We all know that in strawberries some varieties are postillate, and will not properly fertilize unless staminates are planted with them. No doubt, also, the Creveling grape is deficient in staminate flowers, and will be more productive, if planted with other varieties. If any varieties of apples have not perfect flowers the idea is sound, but I am not aware that there are such.

The following essay was then read:

"OUR WINGED FRIENDS"—USEFULNESS OF INSECTIVOROUS BIRDS—THEIR PROTECTION.

By SIMON P. EBY, *Lancaster, Pa.*

Since the time when man first began to till the soil, he has called around him many assistants to lighten his labors and help him earn the bread he was to "eat in the sweat of his brow."

All our domestic animals have, at some time, been reclaimed from their wild state by man, and trained to a higher condition of intelligence and usefulness.

Of the manner in which this was done, we have no particular account. We can read that in those days there were "mighty hunters," and it is to be presumed that when they hunted and slew, they likewise captured and tamed some of the animals, and that the work of domestication was gradually brought about in that way.

The latest accession to the list we believe to have been the wild turkey of the American forest. Why the work should have stopped with him, when other birds of equal merit, if not equal weight, are left to roam at large, is a question that remains unanswered.

Besides our domestic group, there is another and more numerous class that, on account of the kind of food on which they live, and their consequent migratory habits, cannot be domesticated, but are, in their wild state, equally the friends of man, doing him, in many ways, incalculable benefits, which, by a little more protection and encouragement, might be greatly increased.

They Seek Man's Protection.

It is in behalf of some of these neglected, and often times persecuted, friends of the farmer and fruit grower, that we desire to enlist your kind attention and sympathy for the brief space of time allotted to us.

When our remote ancestors, emerging from barbarism, began to build permanent homes, and settle down from a roving to a more civilized life, they observed that many of the tenants of the primative forests began to approach their habitations and take part in the protection of the newly planted fields and orchards, or busied themselves in clearing the surrounding atmosphere.

For instance, one kind of swallow left the hollow forest trees to build in the newly-erected chimneys. The martin and rock-pewee forsook the savage cliffs to rear their young under the friendly thatch. Robin and oriole came to assist, where the hand of the husbandman proved unequal to the work of keeping the growing buds and blossoms free from destructive insects.

Likewise came others, to prey upon the weaker ones, or to feed on the fruits of man's labor. These latter had to be driven off, and thus, between the two classes and man there sprung into existence a mutual feeling of friendship and enmity. They were to him friend and foe. He gave protection to the one, and waged war against the other.

The one coming in ethereal shapes with pleasant voices, to assume their labors at the time their services were needed, and again leaving for unknown lands when the season of usefulness was over. The other issuing from their hiding places, to commit depredation at uncertain and unexpected hours, and again retreating to the depths of the adjacent forests themselves unseen; they left behind them unmistakable evidence of their work—either friendly or hostile.

Fairies of the Ancients.

We can readily perceive how, under such circumstances, the untutored but imaginative minds of our remote forefathers, actuated by their love or hatred, invested some of these creatures with shapes and attributes half-human, and, in that way, peopled the streams and groves with strange beings "visible only by the uncertain glimpse of the moon."

"It is to be regretted," saith a writer, "that the light of modern science has frightened away all our elves and fairies."

This we believe to be a mistake. They are still with us; perhaps less numerous than formerly; but they are still here; as in the "olden time" the whims of the good require to be humored; and the tricks of the bad ones to be guarded against.

In the days of Æsop the beasts were made to speak and the birds to reason. The ancients accepted the fables not according to the letter any more than we moderns do, but for the lessons they conveyed. Even so with the creatures with which they were brought in contact. They represented the good or evil genii that haunted the ancient streams and groves, or hid within the dim recesses of the German forests.

Clothing them in shapes half human only served to bring them closer to man himself, and intensified the feelings already existing.

The transformation must have contributed to the welfare of such as were considered friendly, and to the destruction of those looked upon as hostile.

Learning from the ancients, let us interest ourselves a little more in the creatures by which we are surrounded. In the birds, for instance—as our good fairies, if we choose, or in the light of modern science. They will stand the test either way. Let us get our children and neighbors interested also. Teach them bird history; teach them to observe their habits, the manner of procuring their food and of escaping their enemies; the skill with which they build their nests, the tender affection they show towards their mates, and the untiring industry with which they labor to rear their young. Direct their attention to the fine vocal powers some of them possess, and the sweet and varied songs with which they help to swell the grand hymn of nature. In short, let us learn that bird life has its labors, duties, difficulties, joys, and sorrows, calling for sympathy, very much like human life; and the chances are we will love and protect our "winged friends" more, and in return reap the benefits of their multiplied labors in orchard and field.

Swallow—Night-Hawk.

We will not attempt to treat the subject scientifically, but in our own way—confining ourselves to birds wholly or in part insectivorous, and begin with those that take their food upon the wing. *These constitute the scavengers of the air*, and are provided with long and powerful wings, that sustain continuous flight with ease and great rapidity of motion.

Prominent among them are the different kinds of swallows, the night hawks, and purple martin. They are old acquaintances in Pennsylvania; some of them great favorites with our people, and all of them deserving our fullest hospitality and protection.

They live altogether on flying insects, which they pursue with great diligence and dexterity from morning to night.

The number of insects a single pair of these birds destroy in a season, if it could be accurately computed, would be astonishing. Some faint idea may be formed by watching a nest of the young, while the parent birds are feeding them. From our own observation, we are satisfied that the visits of a pair of barn swallows at such a time was no less than once in every ten minutes each time with their bills well filled with insects.

Mr. Palmer, of Massachusetts, states that he saw a parent bird visit a young purple martin on a church spire opposite his window five times in as many minutes, each time with an insect.

The barn swallow and purple martin by no means homely in dress, are sociable in their habits, and exceedingly graceful on the wing.

The first named, building its nest in or about the barn, follows the farmer to the field, and keeps him company while at work; skimming around and past him and his team—now close to the ground—now over the loaded hay-wagon—then away into the adjoining field, circling among the grazing cattle—it snaps up such insects as may be put to flight by the workmen or animals.

We remember on one occasion seeing a nest of winged ants issuing out of an old fence post. It was not long before a swallow discovered them, and must have communicated the fact to the others; for in a short time quite a flock of swallows and martins were swooping back and forth over the spot, snapping up the insects as fast as they took wing, and few, if any of them, escaped.

The purple martin is equally a favorite. Wherever these birds have once established themselves, which is usually in small colonies, among the habitations in man—they will, if not disturbed, return annually to the same boxes, and become, as it were, a part of the household during their stay. Their coming is anxiously looked for in the spring, their arrival is hailed with delight, and their departure, in the latter part of summer, more or less tinged with feelings of sadness, such as we experience in parting with a friend.

The presence of these birds, like the presence of the swallow, is by many persons considered as an assurance of continued prosperity, while their failure to return would be looked upon as an omen of impending misfortune to the house they have deserted.

They are a lively, garrulous, and spirited bird. Not gifted with the power of song, they seem to make up for this deficiency by an increased love for gossiping. Their early morning salutations in front of their boxes are, however, very pleasant to listen to.

The male bird makes a model husband. During the time his mate is setting, he becomes quite domestic, and spends part of his time in front of the box dressing and arranging his plumage, occasionally passing to the door of the apartment as if to inquire how she does. His notes, at this time, have assumed a peculiar softness, expressive of much tenderness. And yet he is a courageous bird, and will unhesitatingly attack with great spirit and audacity hawks, crows, and other large birds, and even cats, if they show themselves in the vicinity of his home. Thus recalling to mind the closing lines of Bayard Taylor's "Song of the Camp."

> "The bravest are the tenderest,
> The loving are the daring."

"Conjugal fidelity, even where there is a number together," says Mr. Wilson, "seems to be faithfully preserved by these birds."

The martin feeds upon the larger kind of insects; wasps and beetles forming his principle food. We are aware that he has been accused of a failure to discriminate between such legitimate prey and the honey bee, and that neighboring swarms have sometimes suffered in consequence. Be this as it may, for our part we shall find no fault with him on that account. Since its cross with the Italian, our honey bee has become such a pest to fruit growers, that we might well be rid of it altogether.

There are two other well known members of this group with which we could not well dispense.

Our summer sky could hardly be considered perfect without at least a pair of long-winged night-hawks sporting lazily through it, and descending occasionally with a sounding swoop.

Neither would our summer evenings be properly rounded off without a flock of twittering chimney swallows circling over our heads and dropping successively out of sight, as parting daylight is fading into darkness.

Fly Catchers.

In the second group we will speak of those that watch for their prey from the perch, but take it while flying. These are called the *fly catchers.*

Prominent amongst them are the king bird, rock pewee, and wood pewee.

"It seems a provision of nature," writes Mr. Samuels, "that all fly catchers shall only take those insects that have taken flight from the foliage of trees and shrubs, at the same time making the warblers and other birds capture those which remain concealed in such places."

"The king bird, in seizing a flying insect, flies in a sort of half flitting hover and seizes it with a snap of the bill. Sometimes he descends from his perch and captures a grasshopper that has just taken a short flight, and occasionally seizes one that is crawling up some tall stalks of grass."

"Those farmers who keep bees dislike this bird because of his bad habit of eating as many of those insects as show themselves in the neighborhood of his nest, but they should remember that the general interests of agriculture are greater than those of a hive of bees."

He is possessed of great courage, and is more than a match for hawk or crow, which he attacks and drives off whenever they venture into his neighborhood.

The rock pewee, or house pewee, comes to us in the early days of spring, and announces his arrival by uttering the notes from which he derives his name.

Like the swallow he generally seeks his last year's nest and makes such repairs as he fancies necessary; perhaps a small addition to strengthen the outside or a new lining.

The foundation of the nest is composed of pellets of mud mixed with fine roots and grasses, plastered to the wall or other object against which it is built, and lined with soft grasses, wool, or feathers.

His favorite haunt is under the arch of a bridge, or under the eave of a mill or dwelling. Here he can be seen during the breeding season, perched on the branch of some over-hanging tree, or upon the rail of the bridge, or neighboring fence post, flirting his tail, uttering his plaintive notes, and darting about in all directions snapping up the insects which generally swarm plentifully in the locality he has chosen for his home.

The wood pewee is generally found foraging along the edge of the woods that hides his nest, or among the lower branches of the fruit trees near the gardens, and even among the trees growing on the city lots.

Here, like his less shy cousin, he can be seen perched on some projecting twig always on the alert, darting quickly forward and back, catching the flying insects that come within sight of his ever watchful eye. His notes, uttered while thus employed, are similar to the rock pewee, only more plaintive and longer drawn out.

Oriole—Wood Thrush.

The next group embraces those birds that seek and capture their food among the foliage, buds, and blossoms of the trees and shrubs.

Prominent among them rank the Baltimore oriole, orchard oriole, wood or song thrush, the vireos, and some of the warblers.

"The food of the oriole is almost entirely insectivorous, young peas and stamens of cherry and plum flowers forming the only exceptions. These small robberies are but a slight compensation for the invaluable services he renders the gardener in the destruction of hosts of noxious insects. At first beetles and hymenopterous insects form his diet, and he seeks them with restless agility among the opening buds. As the season progresses, and the caterpillars begin to appear, he forsakes the tough beetle and rejoices in their juicy bodies. Even the hairy kind he does not refuse, and is almost the only bird that will eat the disgusting tent caterpillar of the apple trees."

To its usefulness it adds a plumage of rare beauty and brilliancy, a song of great cheerfulness, and a nest wonderfully constructed.

"There is in his song," says Mr. Wilson, "a certain wild plaintiveness, extremely interesting, that is uttered with the pleasing tranquility of a careless plow boy, whistling for his own amusement."

"It is a joyous, contented song," says a writer in *Harper's Magazine*, "standing out from the chorus that greets our half awakened ears at daylight, as brightly as its author shines against the dewy foliage."

T. W. Higginson exclaims, "Yonder oriole fills with light and melody the thousand branches of a neighborhood."

He is a social bird—a bird of sunlight. His hammock-like nest is never found in the deep woods. His haunts are those grand old trees which the farmer leaves here and there in his fields as shade for his cattle, that lean over the briar-tangled fence of the lane, or droop toward the dancing waters of some rural river.

We are now among a host of feathered choristers, to which the song of the oriole is like the bugle notes for the opening of the grand winged orchestra.

Where all possess so much merit, it is difficult to assign precedence. Out of the deep woods, however, comes a beautiful melancholy strain, which is not very common, but when heard cannot fail to arrest the attention.

"The prelude to this song," says Nuttall, "resembles almost the double-tonguing of the flute, blending with a tinkling, shrill, and solemn warble, which reëchoes from his solitary retreat like the dirge of some sad recluse who shuns the busy haunts of life."

"The whole air consists usually of four parts, or bars, which succeed in deliberate time and finally blend together in impressive and soothing harmony, becoming more mellow and sweet at every repetition. It is nearly impossible by words to convey any idea of the peculiar warble of this vocal hermit, but among his phrases the sound of '*a'rioee,*' peculiarly liquid and followed by a trill repeated in two separate bars, is readily recognizable."

We have followed this song, which seemed to recede before us deeper into the woods as we advanced, without getting a sight of the bird, until brought to a sudden halt by a sharp "chuck," when for the first time we saw the object of our search perched upon a twig of a neighboring tree and eyeing us sharply. It was the "song thrush" or "wood thrush," a bird in size between the blue-bird and robin, cinnamon brown on the back and whitish breast marked with well-defined dark triangular spots.

Its notes are uttered while engaged in hunting for insects among the foliage.

Vireos.

Next we have the "vireos," of which there are four reported as visiting this part of our country. The red-eyed, warbling, white-eyed, and blue-headed, all useful birds that feed on insects which, like the two preceding, they hunt among the foliage. They are in size about like the canary, of a grayish olive green, and variously marked as their names indicate. Their nests are pensile—or hanging—generally fastened to the fork of a horizontal twig, shaped not unlike a shallow, open mouthed purse.

Mr. Samuels writes of the red-eyed vireo in the following commendatory manner: "I feel that no description of mine can do justice to the genial, happy, industrious disposition of this, one of our most common, and, perhaps, best-loved birds. From the time of its arrival, about the first week in May, until its departure, about the first week in October, it is seen in the foliage of elms and other shade trees in the midst of our villages and cities, in the apple trees near the farm-houses, and in the tall oaks and chestnuts, in the deep forests, everywhere at all hours of the day, from early dawn until evening twilight, his sweet, half plaintive, half meditative carol is heard, and whenever we see him, we notice that he is busily searching in the foliage of trees for caterpillars and noxious larvæ, or pursuing winged insects that have taken flight from the trees.

"Of this beautiful and favorite family I feel that it is impossible to say too much in their favor; their neat and delicate plumage and sweet song, their engaging and interesting habits, and their well-known insect-destroying proclivites, have justly rendered them great favorites; and the farmer in protecting them and encouraging them to take up homes near his orchard and gardens, but extends a care and welcome to his best friends."

Wren—Blue-Bird.

The wren and blue-bird may be considered together; both being insectivorous, capturing their food alike upon the trees and on the ground, and building in crevices and boxes.

These birds seem to be getting more scarce in late years. In our schoolboy days there was no season that we did not know of a wren or blue-bird's nest. We recollect instances when the wren contended for quarters with the martin, and outwitted him by narrowing the entrance of the box with sticks, strongly and skillfully placed, so as to admit himself, but keep his larger antagonist out.

Wood-Pecker.

The wood-pecker family have been voted great scamps—fruit-stealing, sap-sucking rascals—a proper target for every idle boy, who could handle an old rusty gun, to blaze away at.

Of late years their usefulness has become better understood, and a law enacted to save them from total extermination.

They are the *police of the trunk and woody part of our timber, fruit, and shade trees.* In fact, to us, the red-headed wood-pecker does not seem unlike a liveried policeman patrolling his beat, up and down and around the trunk, and out along the limbs of some old tree, tapping and rattling for concealed marauding insects, and dragging them from their hiding places without mercy when discovered.

We have frequently noticed the trunks of old apple trees punctured in a regular succession of circles; or have seen spots as large as a hand where the bark seemed dead, riddled like the bottom of a colander, all the work of this or a smaller speckled wood-pecker, known as the sap-sucker, in their efforts to dislodge the insects under the bark.

Shall these faithful servants be denied a few of the fruit of the trees they help to save?

A few years ago we observed several Scotch pines in one of our cemeteries treated in this manner, and the resinous sap exuding and filling the punctured circles. Surely, we thought, this time the bird could have been after no honest purpose, and deserved the bad name it bore. Behold, in the following spring one of the pines was dead; and, taking a friend with us, we examined into the cause and found the inner bark of the upper part of the trunk and some of the larger limbs reduced to the condition of fine sawdust, having been entirely eaten by worms. Here the borers had been too numerous or the tree too far gone. The other pines were no doubt saved by the timely interference of this much-slandered bird.

Titmice—Chick-a-dee.

Closely allied in habits of life to the wood-pecker are the titmice and chick-a-dees, of which ornithologists report three as visitants to this part of the country. They feed on insects and the eggs of moths deposited on and in the crevices of the bark and in the buds of trees and shrubs.

During breeding season they are busy through the whole day in capturing vast quantities of caterpillars, flies, and grubs. "It has been calculated," says Mr. Samuels, "that a pair of these birds destroy, on the average, not less than five hundred of these pests daily."

"The chick-a-dee trips along the branches, peeps under every leaf, swings round upon his perch, spies out every insect, and secures it with a peck so rapid that it is hardly perceptible."

Mocking-Bird—Robin.

Last, but not least, in our list comes some of our best known and most reliable friends. Prominent among which are the brown thrush or mocking-bird, robin, cat-bird, black-bird, meadow-lark, chipping-sparrow, song-sparrow, and indigo-bird.

These feed on small fruit, seeds, and berries, as well as on insects, grubs, and worms. They help themselves to some of our early fruit, and in that way sometimes annoy us. Still if an account could be made up of what they take, and the good they do, the balance would show largely in their favor.

They compensate us in still another way; they cheer us with their presence and songs; for amongst them are some of the most talented musicians. Unlike the oriole and vireo, which carol while they labor, this class lay aside other duties when they address themselves to song. Ascending some elevated perch and concentrating all their vocal powers, they pour forth their strains of melody, as if it were to a listening audience.

Mounted on the topmost spray of a neighboring tree or bush, the brown thrush welcomes the farmer planting seed at early morning, with cries of "drop it, drop it, cover it up, cover it up. Pull it up, pull it up; see, see, see; there you have it, there you have it; work away, work away; cover it up."

This bird, although often seen in the orchard and pasture field, generally builds her nest in the neighboring thicket, and seems partial to sprout land, or woods having undergrowth.

A few years ago we considered ourselves highly favored when a pair selected a small evergreen upon the lawn for their nesting-place, and we gave strict orders for no one to go near while the work was progressing, but, unfortunately, some unknown enemy must have discovered them, for one day we found the eggs broken and the nest deserted.

Of the robin, a writer in the *Atlantic Monthly* says: "I shall not ask pardon for assigning to him the highest rank as a singing-bird; while others may surpass him in some particular qualities, the notes of the robin are all melodious, all delightful—loud, without vociferation, mellow, without monotony, fervent, without ecstacy, and combining more mellowness of tone, plaintiveness, cheerfulness, and propriety of execution, than those of any other bird. Without his sweet notes the mornings would be like a vernal landscape without flowers, or a summer evening sky without tints."

Song-Sparrow—Indigo-Bird.

After the noon-day heat has silenced the early performers, the song-sparrow, chipping-sparrow, and indigo-bird continue to sing at intervals during the greater part of the day.

The song-sparrow has been assigned a high place among singing birds. His song is certainly very soft and sweet, without a harsh note in it. We hear it mostly from the hedge rows, and along the edges of grain or pasture fields.

The sprightly little indigo-bird selects the highest twig of some tall tree in the vicinity of his nest to pour out his noon-day song.

Last and least is the chipping-sparrow, greeting us from the fence posts, along the highways and country lanes, with its peculiar, but pleasant, little song, not unlike that of a summer locust.

Shelter—Nests.

Having thus spoken in behalf of some of our "winged friends," as time would allow, leaving, however, many of them unmentioned, and many of the good things which might be said in their favor unsaid; the next question naturally suggests itself: How can we best preserve these winged institutions, which have become interwoven with some of our earliest and happiest recollections of rural life, and hand them down to posterity unimpaired?

The woods, of course, have ever been the great nursery for birds. We do not mean the endless forests which, at one time, covered this country, but belts of timber, with plenty of undergrowth, lying between farms, adjoining the cultivated land, and along the streams. These gave plenty of room and material for nests, were within convenient reach of the sunlight of the fields and the food there found; at the same time there was some protection from man against birds of prey.

As our woods are cleared away we should endeavor to provide other shelter; by saving the trees, wherever possible upon the farm; by planting thickets of young timber in such places where the land cannot be profitaby cultivated. Hedge-rows become good nesting-places for the smaller kinds of birds, and afford protection when pursued by hawks. Evergreens planted for ornament or protection oftentimes attract birds. The summer-house or open building on the lawn or in the orchard is generally selected by the robin for a nesting place. So the shrubbery and climbing vines around the house should be at the service of the chipping-sparrow and warblers. The orchard, of course, we expect to have its full share of nests, and the elm, or weeping willow, or the old pear tree, to have one of its drooping limbs graced with an oriole's hammock. A row of boxes should be put up against the south or east side of the house for the martins; shelvings under the forebay for the swallow, and an opening in the upper part of the barn for them to pass in and out freely, should they fancy that part of the building. Such chimneys as are not used in the summer should be left uncovered for the chimney-swallows. Boxes should be put up against the out-buildings, and on the sheltered side of trees, for the blue-bird and wren; so that the whims of these, our good fairies, may be properly humored.

When these accommodations are provided, and the birds happily do come to occupy them, or some of them, do not interfere with their housekeeping nor suffer anyone to molest them, whether it be thoughtless man or sneaking cat. Do not approach their nests unnecessarily, nor allow anyone else to do so; remember this is a tender point with all birds, and will cause them to change residence very soon. Do not allow the English sparrow to take possession of the boxes and drive the others out.

Water.

One more suggestion and I am done. If there is no running water on your farm or in the vicinity, provide a place for the birds to drink, and where they can get soft material to build nests. Swallows and martins love to skim near the surface of the water and take an occasional dip. Robins and cat-birds will help themselves at the water trough in the barn-yard, but the more shy birds, like the brown thrush, will not venture that far. Water should be kept for their use in a more secluded place.

A cheap bird fountain can be made with an old demijohn or carboy, which can be had at a drug or liquor store for a trifle.

Select a suitable shady spot frequented by the birds and where they will not be disturbed. Place a trough or other shallow vessel on the ground; drive stakes for the demijohn to rest upon in an inverted position so that its mouth will nearly touch the bottom of the trough and hold it in that position; then fill the demijohn and turn it upside down upon the stakes. The water will run out and keep the trough partly filled until the supply in the demijohn is all used; on the same principle as a small bird fountain.

We had a fountain made in this manner with a five-gallon demijohn which answered the purpose admirably, and required refilling about once a week. The depth of the water can be regulated by raising or lowering the mouth of the demijohn.

And now with your "winged friends" properly cared for, yourselves cheered and comforted by their presence and grateful song, your orchard saved from the ravages of insects, and their golden fruit safely stored away for winter use, you may live as contented and happy as it is possible for mortals to be.

Mr. SATTERTHWAIT. This is one of the most interesting papers ever read before this Society, and though of considerable length, it was not tiresome. I would like to inquire of Mr. Eby what birds he referred to, when he said others might have been domesticated.

Mr. EBY. I referred to the quail. I think it might be made useful.

Mr. SATTERTHWAIT. Another very important question was not touched. What about the sparrow?

Mr. EBY. I think the verdict on the sparrow is not yet made up. If, however, they destroy and drive away other birds, away with them; they may do some good. Even the crow is valuable in foraging our fields in winter.

The PRESIDENT. I think when all the evidence is in, the sparrow will be found guilty.

Mr. MEEHAN. No one is more friendly to the birds than myself, but when we see all our cherries and grapes disappear, and destroyed by the cat-bird and robin, it is hard to remember that they do much good for us. Sometimes they do more harm than good, and there is no need in exaggerating either their virtues or vices. No birds are wholly insectivorous, none entirely graminivorous. The yellow bird sometimes changes its habits, and lives on insects. The sap-sucker, too, does not confine itself to insects, but when such food is scarce, it feeds on the inner bark of trees. The question is also whether this boring of holes in the bark of trees is not a greater injury to them than any insects that may be destroyed. On the whole, while birds have their faults, they are overwhelmingly our friends.

The PRESIDENT. Has Mr. Meehan ever hear of the swallow or martin destroying anything but insects?

Mr. MEEHAN. I never have, but think if food was scarce they would.

Mr. COOPER. When we have too many "winged friends," how can we get rid of them?

Mr. ENGLE. When I see robins and cat-birds destroying apples and pears, I can hardly reconcile my practice with my theory on this question, and I sometimes resort to the gun.

Mr. SATTERTHWAIT. I have never known birds to touch anything but strawberries, cherries, and grapes, never knew them to injure apples or pears.

The PRESIDENT. When we balance accounts with the birds, we will generally find the balance in their favor, except the sparrow. The greatest objection to it is, it will drive away the peewee, blue-bird, and other useful birds. I have been informed by travelers, that in some foreign countries rewards are offered for their scalps.

Mr. HOOPES. I think the Society would like to hear the report of the committee appointed last session to confer with the Attorney General regarding a change of name.

Mr. CALDER. I was not present at Gettysburg when this committee was appointed, nor did I hear the discussion in reference thereto. In accordance with the resolution I conferred with the Deputy Attorney General, and he thought there would be no difficulty all. He promised to examine the matter more thoroughly, and we have arranged to meet him in his room to-morrow morning at nine o'clock, when he will be prepared to give us a more definite reply. What reason is there for desiring a change of name?

Mr. HOOPES. Of all the original fruit growers' societies organized in the United States, we alone stand under that name to-day. The name "Fruit Growers' Society" is narrow and limited, and does not represent the scope of the work in which we are engaged. We are not mere fruit growers, but we want to grow beautiful trees and flowers, and make our homes pleasant and attractive. We have already a Pennsylvania Horticultural Society, but it is contracted in its limits and scarcely known outside of Philadelphia. It is not a State organization.

Mr. SATTERTHWAIT. I cannot see why we should want to change our name. Our Society is very prosperous now, and I don't think a change is advisable.

Mr. KELLER. I think we had best hold on to our old name.

Mr. ENGLE. Our new name is more comprehensive, and would materially enlarge the scope of our work. I don't think it is likely that the publication of our reports would be endangered by the change.

The PRESIDENT. I think to adopt the name proposed might cause confusion with the other society in our State.

Mr. EBY. It seems the present name does not restrict us to the discussion of fruit growing alone. I would favor the old name. It is plain Saxon and every one can understand it.

Mr. SATTERTHWAIT. I move the whole question be indefinitely postponed.

Mr. HOOPES. The motion is not in order. We have appointed a committee on the subject, and should hear their report before taking action.

On motion adjourned.

MORNING SESSION—THURSDAY.

The Association was called to order at nine o'clock.

Mr. SATTERTHWAIT. There is a question of very great importance to fruit growers and one which I would like to hear discussed. I refer to fruit-houses or refrigerator-houses for storing fruit. It is very important to know how to build them on a small scale. Many, as now built, are too large and expensive and are not adapted to individual use. I would like to ask whether a house can be built to keep fruit back, holding two to three or four thousand bushels with one to two hundred tons of ice. How about those at Reading?

The PRESIDENT. I don't think it possible to keep that quantity of fruit with so small a quantity of ice.

Mr. BALDERSTON. I hope Mr. Carter will explain the principle upon which his house is constructed.

Mr. CARTER. The room that Mr. Balderston refers to is used for the storage of butter and cream, but I have no doubt that one on the same principle would certainly keep fruit, and do it economically.

From the principle of its construction we can secure dry, pure air, with no outside ventilation; and as low a temperature as is needed, only using ice when the room is in use or the temperature of the room requires it.

My room is a basement, ten by fifteen feet and ten feet high, with double walls, all arched and sodded. At one end of the room is a slatted ice-box four feet wide, extending the full width of the room, and placed five feet above the floor.

The front of the ice-box is boarded tightly to within six inches of the ceiling, to admit a current of air to the top of the ice, which, as cooled, passes down through the ice and slatted bottom of the box to the floor, thence along the floor to the other end of the room, where it rises as it becomes warmed, and passes back again along the ceiling to the ice, thus securing a current that carries off surplus moisture and all impurities, depositing them on the ice to be carried off in the melted ice. Such a room is always dry and sweet, and with double doors and windows and walls can be kept cool with very little ice. The ice is put in through a trap in the ceiling.

Fruit-rooms are usually under large bodies of ice, the whole ceiling being the cooling medium. No current is possible in such a room without outside ventilation, which admits warm air. Dryness is also impossible, because moisture condenses on the coolest surface presented, *i. e.*, the whole ceiling, and hence moisure remains in the room, causing moldiness and impurities in the air. These houses are also wasteful of ice, because it is always melting, whether the room is in use or not. They are also, necessarily, very expensive, having to be built strong and large, capable of holding large bodies of ice, while refrigerator-rooms like mine can be built cheaply and of a size to suit the wants of the common fruit grower.

Mr. SATTERTHWAIT. That will not keep fruit. What we want is a fruit-house not too large and expensive, that will keep Bartlett pears a month. Mr. Shearer's house at Reading is no doubt the thing, but it is too large for individual use. I understand it requires about one thousand tons of ice.

The PRESIDENT. His house is twenty-four by forty feet. The modern fruit-houses are much improved, having ice only over head.

Mr. SATTERTHWAIT. That is a bad shape for a house. It should be square. A room twenty-four square and sixteen feet high will not hold more than one hundred and fifty tons of ice. Should there be a double wall with an air-chamber?

The PRESIDENT. Twelve-inch studding or joice are used, being weather-boarded on both sides, and the space filled with charcoal. The most modern houses are built about twelve feet high, of stone or bricks, upon which a frame is built with twelve-inch joice for studding. They are ventilated through the sides and can be run with one third less ice than the old style refrigerator houses.

Mr. CHASE. I think it a mistake to fill up with saw-dust or charcoal. Air is a better non-conductor than either.

Mr. PANNEBAKER. There was a house of this kind built at Lewistown last winter. I can't give the exact dimensions, but think it is about thirty feet square and thirty feet high. It is, however, a patented arrangement, the party having paid $600 for the use of patent. The building was used last season for butter and eggs, and pronounced a success. Did not use over one hundred and fifty tons of ice at the outside. It will be tried with fruit the coming season.

The PRESIDENT. A house that preserves eggs will keep fruit. There is much difference in the keeping of different kinds of apples. Kramer, for instance, which is easily kept in an ordinary cellar, will not keep in a fruit-house. Pound is one of the best keepers.

Mr. **LINT.** In my opinion it is not necessary to have a lower temperature than thirty-eight degrees to keep fruit. If kept at a lower temperature it will not keep so well when brought out.

Mr. **ENGLE.** When I built my first ice-house was very careful to have it closed tightly on top. It did not keep very well, and the ceiling was torn out, after which it did better. The house I have now is not over nine feet square, and built in a wood-shed, not closed tightly at the sides, and no cover at all on top, except sawdust during the summer. It is about six or seven feet underground, and half of the bottom is used as a side cellar. I have not been out of ice for years, can keep milk sweet three or four days in July, and often keep fruit in it for weeks.

Mr. **SHARPLESS.** I have a house on the same principle, and have no trouble in keeping ice.

SOME PRACTICAL POINTS IN PEACH CULTURE.

By E. SATTERTHWAIT, *Jenkintown, Pa.*

Before reading his essay, Mr. Satterthwait stated that there was just one point in the President's address last evening to which he would take exception. I think he is mistaken when he says Pennsylvania is not adapted to peach culture. I think there is no country so well adapted to this fruit as our State. That is my conclusion from observation and experience. It is one of our most important fruit crops.

Having reason to think that my experience with peaches the past season was something remarkable, inasmuch as I had a fair crop amidst almost universal failure, and as this is a subject of growing importance to the fruit growers of Pennsylvania, I propose to lay before the Society a few points that may be of interest, from some notes that I have made, principally in regard to the relative hardiness of different varieties.

I see that Secretary Edge, of the State Agricultural Department, in his report of the crops for 1881, reports on fruit as follows: Comparative yield compared with average crop, apples, 105; pears, 100; cherries, 100; plums, 110; grapes, 100; berries, 100; peaches, none. So far as I am able to judge, this is about correct. And thus it appears, that while all other fruit crops were as good or better than common, in this part of the State, peaches were a total failure. And yet I had, as I have stated, a satisfactory crop, for though many varieties failed almost entirely, others were wonderfully fine, both in quantity and quality. And this in spite of the very severe drought which greatly injured some. I do not pretend to be able to give any explanation of this, but the question is certainly an interesting one, why, amidst otherwise universal failure, one should be even partially successful. The cause of the general failure of the peach crop last year, as every one knows, was the extreme cold of last winter, the fruit bud of the peach not being able to withstand a very low temperature. And yet it would seem that there must be some other causes or conditions not yet understood, because it is not to be supposed that any one particular locality could escape, when the severity of the cold was so great and long-continued, as was the case last winter. It is not my purpose in this paper to advance any theory in explanation of the facts above stated, for though I have some crude notions on the subject, I prefer, in a paper of this kind, to confine myself entirely to the statement of facts.

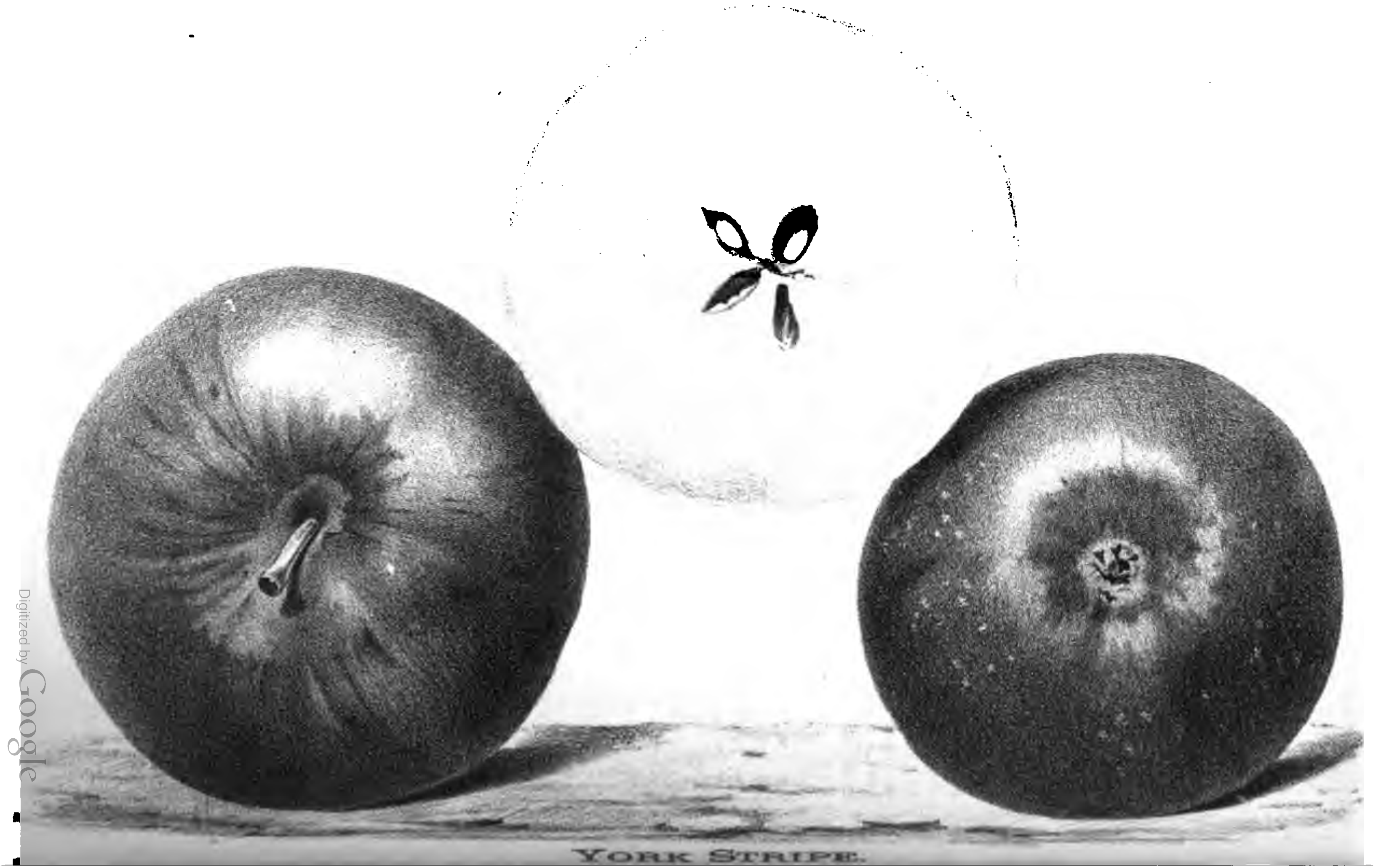
Having noticed early in the season that while the fruit buds of some varieties were almost entirely killed and others only partially, and some had almost entirely escaped injury, and having had about seventy-five varieties under cultivation, I determined to observe, particularly, which were most hurt, and which withstood best the trying ordeal. For this purpose, I carefully noted in a book kept for the purpose, how each variety came out, and I am thus able to lay before the Society some facts in regard to the relative hardiness of most of the leading varieties under cultivation in this region, which may be of great value, particularly in localities where peaches are very liable to be injured by cold.

In the following list, which for convenience, I have arranged in alphabetical order, the relative hardiness of the different varieties is given in a scale ranging from 1 to 100, the highest number representing a very full crop:

Amelia,	90	Late Admiral,	80
Alexander,	50	Late Rareripe,	15
Atlanta,	40	Mary's Choice,	5
Beer's Late,	1	Mountain Rose,	15
Beer's Smock,	60	Nanticoke,	100
Bernard's Early Yellow Alberge,	100	Newington Free,	15
Bilyeu's Late October,	90	Old Mixon,	20
Bilyeu's Late Comet,	100	Orange Cling,	90
Brandywine,	5	Piquet's Late,	10
Brigg's Red May,	50	Price's Late,	100
Chinese Cling,	1	President,	100
Coolidge's Favorite,	15	Prince of Wales,	100
Crawford's Early,	2	Princess of Wales,	20
Crawford's Late,	20	Reeve's Favorite,	15
Crockett's Late,	80	Richmond,	2
Druid Hill,	50	Ruding's Late Red,	50
Early Beatrice,	50	Salway,	20
Early Louise,	75	Smock,	80
Early Rivers,	75	Snow,	90
Early Tillotson,	50	Shipley's Late Red,	10
Early York,	40	Stump the World,	40
Foster,	15	Steadley,	20
Freemason,	50	Susquehanna,	1
Geary's Holdon,	10	Temple's White,	25
Golden Eagle,	100	Thurber,	90
Hance's Golden Rareripe,	2	Troth's Early,	90
Hale's Early,	90	Transom's Free,	1
Harker's Seedling,	75	Tuckahoe Late,	50
Jarrett's Late White,	15	Van Buren's Golden Dwarf,	2
Keyport White,	50	Ward's Late,	50
Kitrell's Favorite,	25	Wilkin's,	25
Legrange,	15	Yellow Alberge,	50
Leatherbury's Late,	100	Yellow St John,	25

I should state here that there was no difference worth noticing as to the exposure. Some trees were, of course, more exposed to the cold winds, and some were on higher ground than others, but where the same varieties were in different exposures and different altitudes, there was no noticeable difference, except that old trees did much the best. All had about the same treatment as to cultivation, manuring, &c.

I do not propose to say more at present on the question of varieties, except that of all the early kinds I have tried, none are worth having. They all thrive, bear abundantly, and look very promising up to the time of ripening, when every one rots, just before they are fit to pick. If there is one variety earlier than Mountain Rose worth anything, I have not been fortunate enough to get it, though I have tried many. My object in this paper more than anything else, is, to bring before this Society some questions connected with peach growing that appear to me to be very important, and on which light is very much needed, and one of these is, the subject of the universal rotting of all the early varieties. I wish to ask, first, is there a good variety earlier than Mountain Rose or Early York that don't



YORK STRIPE.

all rot before ripening? Second, does anyone know the reason why, or can anybody throw any light on the question, why all the early varieties rot, when later ones in the same ground and same kind of weather, do not?

I have also a few questions concerning yellows that I consider very important. It is claimed now by experts, that the cause of yellows is a specific fungoid affection, which is in some way communicated from one tree to another, and when once the poison finds its way into any part of the tree it spreads itself by the circulation of the sap or otherwise until the whole tree is affected, and in time destroyed. And when this infection has once entered a tree there is no remedy but its removal to prevent further spread of the disease. Admitting this much to be settled, there yet remains much more to be learned in connection with this all important question. Mr. Rutter says, and I believe all other practical writers on the subject say, remove at once, root and branch, and some day the diseased tree should be immediately burned. Now, what I want to get at is, is this really necessary? Even if it were practicable. To remove a tree immediately, root and branch, is a very easy thing to recommend, but to put in practice next to impossible. The roots of a peach tree ten or twelve years old, in rich and well cultivated soil, will be found to have run fifty and perhaps one hundred feet or more, and their total eradication would require besides an immense amount of labor, the destruction of all the other crops and trees within a circle of fifty to one hundred feet in diameter. I have peach trees eight inches in diameter, some of the roots of which I have no doubt run for one hundred feet, and most of them must be more than a foot beneath the surface, as the ground is constantly ploughed about that depth. The total eradication of one of these trees would involve the destruction of perhaps a quarter of an acre of strawberries or some other crop, besides a dozen or more pear or other peach trees. Sometimes these trees will get the yellows. For, according to my experience, none escape, it being only a question of time. It is needless to say that I do not "totally eradicate" such trees. I do not even attempt to remove the roots, because to do this thoroughly would cost in labor and destruction of other crops, where at least five per cent. of the trees have to be removed every year, more than the whole peach crop would be worth. I am aware that it is the practice, perhaps in most of the peach growing regions and particularly in very light soils, to remove old and diseased trees by drawing them out with a strong team, perhaps a yoke or two of oxen. But in that case I imagine only a small portion of the roots are removed. I am sure it would take at least a dozen yoke of oxen to pull out some of my trees, and then the greater part of the roots would be left in the ground. To cut down and remove even a large peach tree is a very simple thing to do, and costs but little time and labor. But taking out by the roots, or, as Mr. Rutter says, totally eradicating root, body, and branch, and that perhaps at the busiest season of the

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YORK STRIPE.

A well-known apple, popular in Southern Pennsylvania. It originated in York county, and is a moderately vigorous grower, bearing early, and producing very full crops on alternate years. Mr. Downing thus describes it:

"Fruit rather large, roundish, slightly conic, slightly angular; skin pale whitish-yellow, shaded, and rather thinly striped and splashed with light bright red over the whole surface, but quite faintly on the side least exposed to the sun; stalk short, small; cavity large, deep, a little greenish; calyx open or half closed; basin large, deep, slightly corrugated; flesh white, rather coarse, breaking, moderately juicy, mild sub-acid; good; core small. January, February."

year, is what I imagine no one ever gets done. Now the question I want to get at is, is this really neccessary? And this brings me to the other great question in which all other questions connected with peach yellows are involved. How is the disease communicated from tree to tree? Is it by actual contact alone, by being conveyed by the knife or saw in pruning; by contact of the roots, or as some have supposed by bees flying from tree to tree and carrying the pollen from diseased trees to the flowers on a healthy one and impregnating that with the poison? Or does it spread by sporadic infection or any way other than by contact? And then again if the disease can be spread otherwise than by actual contact, it is very important to know at what season of the year are trees liable to be infected. Is it at all times or only when the trees are growing or in leaf? This is important, because, if a tree that is not in leaf cannot receive or impart the disease except by actual contact, it is difficult to understand what harm a dead stump of a tree could do by remaining a few years, until it rots and gets out of the way of itself, which it soon does. If, as Mr. Rutter says, the disease is communicated by contact of the roots, the mere grubbing out, or even drawing out with oxen, only removes a small portion of the roots of an old tree. And then again another question of great practical importance presents itself. How long after a tree has been cut down, or grubbed out, or drawn out with oxen, if you please, will the roots that remain in the ground retain the disease so as to communicate it to another tree? I profess to know very little about fungi, but it seems contrary to all that I have heard on the subject, to suppose that a fungus which would thrive in live wood or bark would also live and thrive in dead or decayed wood.

I have dwelt perhaps longer than I ought, upon what may seem to most persons a matter of little importance, but it is because I have found it to be a matter of great practical importance, so much so, that if I really believed it necessary to do what Mr. Rutter says must be done, I would at once abandon peach culture. Though I have never pretended to understand the yellows, and certainly have no theory about it, I cannot forbear saying here, that I have some doubts about the roots being affected to any great extent, because, while all peach trees get the yellows, sooner or later, a tree with peach roots, the body and limbs of which are plum, will never take it. I have often thought it would be an interesting experiment to try how far the peach and plum might be grown together on one tree, without being liable to this disease; suppose the plum is worked on the peach several feet above the ground, or suppose a peach tree, say three years old, and free from disease, has all its branches worked with plum, and no peach buds allowed to grow, so as to have, as near as possible, a peach tree with plum leaves. Would such a tree be liable to the yellows? If not, it would go to show that the infection is only received through the medium of the foliage or blossoms. Or else that the development of the disease is something incidental to the growth of the peach, and the fungi that are found in trees affected with the yellows are only the effect and not the cause of the disease.

Of all the theories that have been advanced in regard to the spread of the yellows, the bee theory seems to me to accord best with the facts. How else can we account for the fact, that if a peach orchard of perfectly healthy trees is planted a mile or more from any other peach trees, as soon as the trees begin to bear, the disease will show itself, not, however, in regular rotation from tree to tree, as might be supposed would be the case, if the disease was spread by sporadic contagion, by contact of the roots, or by means of pruning implements, but jumping about; sometimes one, and sometimes two or three trees in a spot affected; just as bees are observed to fly, skipping about from one part of an orchard to another.

But, as I before said, it is not my purpose to go into a theoretic discussion, my only object being to bring up practical questions with which we are brought face to face in our daily practice, a proper solution of which is of the utmost importance.

For fear that the points that I have endeavored to bring out may not be clear, I will recapitulate. *First:* What varieties will best withstand severe cold? On this I hope I have thrown some light. *Second.* Why do all early varieties invariably rot prematurely, or are there any that do not? In regard to the yellows. *First.* How is it communicated from tree to tree? *Second.* Will the disease spread otherwise than by actual contact, except during the period of growth? These questions are very important in their bearing on the all-important practical questions: Must a tree be immediately removed on showing the first symptoms of the yellows? and must it be totally eradicated root and branch? To these may be added the following: If, as is supposed, the disease is a fungus that pervades the bark of the living tree, will this same fungus live in dead or decayed wood or bark, so as to communicate the disease to another tree, the roots of which may come in contact with them? There are, of course, a great many other practical points in peach culture, which might have been introduced that might be interesting to many, but it was not my purpose to bring up questions that have been often discussed here, and which are, or should be, now considered settled. I think we ought to make some progress, and I desire to take a step in advance, and if I only succeed in awakening an inquiry that may throw some light on what are, as yet, some dark places in the path of the pomologist, my object will be accomplished.

Mr. VORIS. Did you ever notice any difference between natural trees or seedlings and budded fruit? Do you think the former are as liable to be affected by yellows as the latter?

Mr. SATTERTHWAIT. Rather more likely if anything.

Mr. VORIS. I thought continued budding might finally run down the constitution of the trees.

Mr. COCKLIN. I think seedlings are more likely to take yellows than the budded fruit.

Mr. ENGLE. In reply to the question of early peaches rotting, I would say I have fruited some eight or ten varieties earlier than Hale's. Among them were Wilder, Amsden, Alexander, Downing, Saunders, E. Rivers, Honeywell, and others, and have found some of these varieties almost entirely exempt from rot. They are not real clings nor yet a perfect freestone. Some are glandless, some have globose, and some reniform glands. I find no difference in the fruit, but those having glandless leaves are not so vigorous in growth as the others. Have not yet fruited Waterloo.

Mr. SHERFY. Mr. Satterthwait's experience has confirmed my own views fully. We must find what varieties are adapted to our soil and climate. Salway, for instance, does not stand high with him, while with me it will stand more cold than any of sixty or seventy varieties. Last winter all fruit buds were killed, but in fifteen years have had only two total failures. Smock also stands well with me. When yellows appear I cut down the trees and burn them and apply ashes and lime to the soil. Hale's Early rots badly with me, and some of the new early sorts have a tendency to rot. Troth's Early Red comes before Mountain Rose and does not rot. I regard cultivation necessary to success, and attach little difference to location, and no difference between natural and budded fruit as far as tendency to yellows is concerned.

Mr. CHASE. Many varieties will not reproduce themselves from seed, but I think Smocks will, and so will Wager.

Mr. STONE. In western New York Wager has an excellent reputation. It bears young and is very valuable as a variety for canning. Few peaches retain their flavor, when canned, like the Wager. It is fair size with a small pit and never fails in its native section. It is not of highest quality, but very productive and hardy.

Mr. ENGLE. This variety seems to attract considerable attention. What is its size and time of ripening compared with other varieties?

Mr. STONE. It ripens about with E. Crawford. It is medium in size and sometimes lacks character in color.

PEACH YELLOWS.

Mr. HOOPES. I very much desire that no remarks go into our report contradicting our former record on the question of Yellows. It has been the subject of most careful experiments and observations by scientists, and their conclusions are based on facts that can scarcely be doubted. It is well known that it is a fungoid disease, which is spread or propagated by spores which float in the air, but are so small that they can only be seen with the most powerful microscopes. When these spores come in contact with a tree that is in proper condition to receive them it becomes diseased. Another tree may not be in condition to receive the spores and escapes. Some twelve years ago, when President of this Society, I gave a history of the fungoid theory as advanced and explained by Professor Burrill and others, who have thoroughly studied it in all its details.

Mr. SATTERTHWAIT. I hope this Society, in its discussions, will not be bound by any alleged authority in this matter. I will not dispute the fungoid theory, because I have had no opportunity to investigate it closely, and do not know enough about it. I hope those who know so much about it will enlighten us, and I would like to ask a few questions. How is the disease communicated from one tree to another? Can it be communicated when the trees are dormant or not growing? Is it at any other time than when in leaf or blossom that these spores take effect? I think the "fungus" theory no better than any other. If a "fungus," why do seeds of trees, affected by yellows, produce diseased trees? Again we are told that this fungus will live only in its peculiar variety of tree or in its particular element. Will this fungus, that lives in the growing living wood, live also in dead or decayed wood? Will it live so as to impart the disease to another tree which may be planted in the same place?

Mr. HOOPES. It can be propagated, not only by spores, but by the root-like fibers or myceleum.

Mr. SATTERTHWAIT. My understanding of yellows is that it is something incidental to the growth of the peach, and cannot be developed except when the tree is in a growing condition. One test of first symptoms of yellows is to see single specimens or branches ripen prematurely. I usually cut down all diseased trees in winter and have experimented by replanting beside of the old stump of the diseased tree. Have some planted three or four years and see no sign of disease yet; my method of cultivation is to plow twelve inches deep every year. I think deep plowing had something to do with the fine crop of fruit I had last year. The roots being so deep from frost I think my trees were better able to resist the extreme cold. I don't see any trees that look as vigorous and thrifty as my own, and I attribute it to high culture.

Mr. Thomas Meehan then addressed the Association on

LILIES AND OTHER BULBS—HOW TO GROW THEM.

MR. PRESIDENT: I have but a few off-hand words to offer, not having had sufficient time to prepare any more extended written remarks. I hope, however, the Association may be satisfied with what I shall say, although it may perhaps be said in a somewhat rambling and disconnected manner.

I was much interested in one of the reports read yesterday afternoon, in which occurred this idea: that unless the fruit-grower is satisfied that he can raise fruit with profit he had better give it up, and buy his fruit in the market. I sympathize with that idea. To engage in business successfully means to put money in our pockets, to reap a golden harvest. But after we have obtained a fortune from the sale of fruits or flowers,—after we have got all we expect to get from the soil and have filled our pockets with money, what are we to do with it? We must learn to put the money to some use. If we examine into the course of our experiences, we shall find that very nearly all we make is spent in adornment, in beautifying and making ourselves or our homes attractive. That is really the great object for which we work. We do not live and labor simply to get clothing and something to eat; otherwise we might live as plainly as possible; there would be no reason why we should have this ornamental carpet here upon this floor, for sack-cloth would do as well; nor need we have our walls, book-cases and books decorated, when to have them perfectly plain would answer.

But there is in us an innate love of beauty, and what we work for is really that we may spend the proceeds of our labor in ministering to this love of the beautiful. It is interesting to observe how closely the imagination is connected with all we do. It is really part of our existence, and our physical comfort depends almost wholly on the cultivation of the beautiful and the cultivation of the imagination.

I remember many years ago reading an account of Fremont's exploring expedition over the Rocky Mountains. Their provisions gave out and they came to the verge of starvation. While in this condition, they paid a visit to a Shawnee camp, where they were highly gratified to find some thing very good to eat. They partook with gusto of what they supposed to be dried fish, but afterwards some one of an inquiring disposition learned that it was dried worms which had been scooped up from the lakes and preserved in that manner. No doubt that dainty dish was just as delicious to those savages as any of our best dishes would be to us. And although when Fremont's men ate the worms they enjoyed them, yet afterward when informed of the truth, every one was sick. (Laughter.)

This illustrates the force of imagination. Imagination actually becomes a part of our existence, and unless we cultivate it properly we become one-sided, and really only go through one half of the pleasures we were intended to enjoy. The Indian, who is supposed to be not over-fastidious, and to whom we may suppose all would be fish that comes to his net, when given some delicate and highly-prized white man's food will become as nauseated as were Fremont's men by the Indian's dried worms, though he should enjoy it ever so much, if told afterwards it was "dog meat." So you see the imagination is also not without power over the savage stomach.

When we consider these things we need scarcely apologize that a subject like the lily is brought before a fruit growers' society. We want to get rich by the different trades and professions, but, at the same time, unless we cultivate the ideal and the beautiful we only perform part of the duties, and attain part of the objects for which our Society is called into existence. But I am glad that the subject of Lilies was assigned to me, because there are many lessons to be learned from it. It teaches us something about the laws of plant growth—laws which, having been developed of late, are of immense value to the practical man who cultivates for the mere sake of money. It is not only right that we were taught, two thousand years ago, to "Consider the lilies of the field," I think we may do so to-day. The lessons of the lily go back, perhaps, very far into the past, too.

You may, perhaps, know something of the associations connected with it, and there are many stories in ancient history that really give value to these associations. And there is much in association, notwithstanding we have been told by that æsthetical poet, Oscar Wilde, that there is nothing in association which gives value to this flower; that we do not love the lily on account of its associations or perfume; but solely because it contains beauty. I think there is a great deal connected with its associations, and that gives its value to it, in my opinion.

The Greek word *λεὶριον*, whence we get our word lily, signifies, literally, the chief of flowers—the flower of flowers. And the Greeks went so far as to imagine that the lily was really created by the gods. That idea, however, they entertained in common with regard to many other flowers. The lily itself was created, it is said, in this manner: While Juno was in the act of giving suck to Hercules a few drops of milk fell to the ground, and on that spot there afterwards appeared the lily. It therefore had, they believed, a divine origin, and on the account of this pure milk, they called it the purest of flowers. By the emblematical poets, those who coin the language of the flowers, the lily is considered the emblem of purity; and even now, if we wish to typify purity, we take the lily. The lily is the highest type of purity. It is the many associations clustered around the lily that give it its chief value in spite of æsthetic protests. It is certainly a very pretty flower, but there are many others quite as sweet and beautiful, and yet, to-day, we associate it with the highest and best. This goes to show that there is something in association.

Another lesson which we may derive from the lily relates to the formation of flowers, and that is one point I had in my mind when I referred to the lessons in modern fruit culture, which we may derive from the lily. It is only of late years that we have found that the same laws which produce color in the leaves in the fall also produce color in flowers. We may study these two points together, and when we do so, we will better understand how to grow fruit trees. We know that in the fall leaves begin to color, and if allowed to remain on the tree a short time they become very bright, but if taken off immediately the coloring process begins, coloring goes no further. We have thought, until of late years, that color was brought about by chemical action alone; that color was in the nature of ripeness. The ripening of fruits is generally supposed to be a chemical process. If an unripe apple, which is highly colored at maturity, be taken from the tree and laid in the sunlight it ceases to gain color; or, if taken when only half colored, it remains just as it is; so that we see that color is not wholly the effect of ripening. Life must be somewhat checked, but not wholly cease, ere color comes, then chemical action comes in, but not till life is in a weakened condition. So you see it is chemical action and life, together, which produce coloring.

Now, we find that precisely the same thing is true of flowers. With flowers there must be some check of growth to produce brilliant color, just the same as there must be some check in the growth of an autumn leaf.

Again, we find an illustration in the short-lived character of its petals. We know that a petal is nothing but a leaf changed somewhat. In the Calla lily we see, for instance, the process of change from the leaf to the flower, and in many others we can trace it. We find that while a leaf will last through the whole season, yet the petals of the lily, and of other flowers, will fall in two or three days. One might say that the petals are nothing but changed leaves. But why will they not last as long as leaves? There we see the same law prevails as prevails in the fall of the leaf. The leaf is on the road to a change before it changes its color. So with the petal. So we see the analogy perfectly, and we learn that the flower and the coloring of the leaf are subject to the same laws—that the laws which produce them are the same.

Another matter which we find in connection with flowers is that it takes a different degree of heat to form them, and it is the difference in this degree which makes the difference between the petal and the leaf. It takes less heat to make the flower grow than to make the leaf grow. We discover that in this way: If we take up a lily bulb in the fall and cut it through, the indications of flowering are there. We can see with a microscope the small flower which forms the lily bloom. That bulb may weigh, probably, four or five ounces. Take it up again the following spring, and, no matter if it has been enclosed by frost in the winter, it will be found to weigh about the same as in the fall, but the little flower-bud has become so large you can almost handle it. Remembering that the lily flower and lily leaf are almost the same thing, we ask ourselves why is it that the flowering part of the bulb has grown, while the leafy and other portions of the plant have not grown at all? So when we see that in the lily, or in the hyacinth, the flower grows all the winter season while the other portions do not, we ask ourselves the reason for this peculiarity, and can only answer, it takes less heat to make the flower than the leaf. We learn this from the lily, because it is so large and we can see the different stages of growth better, and we infer that the same law operates in the case of small flowers, especially with the smaller flowers of our fruits. Going to the fruit trees, we find precisely the same laws to prevail in the process of flowering, as we see in advance in the lily. We may find it in the apple, the peach, the maple, and, indeed, all spring flowers. Just before the fall of the leaf we can see no difference in the size of peach buds. But soon after the fall of the leaf the flower-buds get larger, and while the leaf-buds stand still the flower-buds keep advancing during the whole winter, even when the thermometer gets down to as low as ten degrees below freezing point they still grow, till, by the first dawn of spring, they are ready to open, but the leaf-bud has stood still. So we see it takes less heat for a flower-bud than for a leaf-bud. From the lily, therefore, we have the valuable lesson suggested which we may apply to the fruit trees. If, now, we wish to keep our buds from injury during the winter, we must do everything to discourage this winter growth. We must do all we can to keep temperature low, because it takes but very little heat to encourage flower-buds.

We know from other experiences, also, that when anything is growing in summer or spring time, the young growth is easily affected by the frost, while the mature leaf is entirely uninjured. So in the flower bud, which, as I have explained, is composed of young metamorphosed leaves, if the frost is severe enough to penetrate the bud scales to the immature portions, it will be easily affected by the cold. The more of this immature growth, then, the greater the chance of injury. We see the flower ready to expand with the first heat of the spring, while it is two or three weeks before the leaf comes. The leaf has not advanced as the flower has.

Applying this lesson from the lily to fruit trees, we see that if we wish to preserve our fruit trees from frost, we must check the continuous growth of these little flower buds in winter; whatever tends to check that growth will tend to preserve the buds. So that a peach tree on the north side of a hill will go through the winter entirely uninjured, although the winter may be very cold, while one on the south side which, perhaps, has had a few days of exposure to the warm sunlight, which has caused the flower buds to advance, will be destroyed. Last year in Tennessee and Georgia I found peach buds killed when the thermometer had not been low enough to kill tender trees, destroyed by a few degrees below freezing point, which would have resisted zero in the north, simply because the warmth in the winter had advanced these buds a little. In like manner, if the ground is covered with any material which tends to prevent radiation, such as grass or mulch, that tends to preserve the buds. That is another illustration of the lessons to be learned from the lily.

Then another very interesting lesson is to be learned from this which we may apply to many things. The belief is general—and it was mine till a few years ago—that when a plant began to grow in the spring it continued to grow until the frost came, or the dry weather, or the end of the season, or the like brought it to a standstill. But we find by studying the lily blossoms that instead of the growth being continuous, it is by waves or jerks as it were; that a portion of the plant may remain entirely quiescent while other portions are growing, and that these waves of growth continue from the beginning to the end. The lily is one of the plants which has taught us this.

There are three distinct rests or stages of growth in a lily flower: First. Pendant, then horizontal, then erect. When the flower first makes its appearance it seems to hang down from the stalk, and remains that way till the flower buds expand, and then it takes two or three days for the petals to expand and grow; two or three days afterwards the flower becomes horizontal, and remains that way till it is fertilized; and then as soon as it is fertilized and the petals fall, it becomes erect.

Different species of lilies have different stages of growth. Some never get perfectly erect. Some remain pendulous. But in cases where the flowers remain pendulous, you will still find the three different stages of growth. The flowers which are always pendulous first come out horizontally from the stalk for about two inches and then bend downward, and remain in that way, curling over; and after they mature somewhat, instead of becoming erect, as others do, they still retain their pendulous character. But after the flower is fertilized, still it grows up again. And in fact you will find in every lily, no matter what may be the ratio of its growth—no matter whether wholly horizontal or partly pendulous—the seed vessels all become in time erect. And that is the point I am coming to, to teach us another lesson in fruit growing.

We often want to know whether a flower is really fertilized? For instance, if we want to cross an apple or a pear with some other variety, we want to know to a certainty whether its own pollen may not possibly have been received in some accidental way. We want to feel sure about it, if we can, because we know a seedling apple or pear takes a great many years before it fruits, and for that reason we would like to know certainly whether it has been hybridized or cross-fertilized. In the case of the lily we have learned that if the flower is fertilized, as I have said, then the young seed vessels become erect, and not till it is fertilized. The lily makes three distinct stages of growth if it is not fertilized, and if it is fertilized it makes four; and you find the same when you come to examine all other flowers. If the flower is really cross-fertilized, it at once changes its position, and we can tell in that way whether we may reasonably hope for good results from the cross-fertilization. That is another great practical lesson we may learn from the lily.

Having now endeavored to teach you some of the many lessons from the lily, I may now, perhaps, look to the other part of the subject as it was given to me—its culture. In studying this we may learn a lesson from the geography of the lily. It is really a northern, sub-Arctic, plant. The greater part of the lily family is found in the northern regions. They extend to the region of perpetual snow. A great number of species are found in the immediate region of the recession of the glaciers. Many are found in Siberia and the northern part of China and Japan, and the cooler and more temperate regions of those countries. The further south we go the fewer we find till we get, say to the Gulf of Mexico, where there is only one species. South of that they wholly disappear, unless we get into the high mountain regions, and then we find a few in the high elevated land of South America, but, of course, a high mountain region is equivalent to a more northern climate, where the temperature is always low. Therefore, in its culture we must remember that the whole family is a northern family, and consequently we must be careful not to plant lilies where the ground is very hot or dry, but rather where it is cool and moist. And we shall find the greater portion of our success to depend on that one fact—whether it is growing in very dry and warm ground, or in ground cool and moist.

And then again we find a very singular fact in studying their locality; that just in proportion as they are taken southward they seem to go deeper in the ground; the bulbs are found often six inches in the ground, south, while in the north the bulbs are nearer the surface—immediately in the surface; some, in fact, forming bulblets on the leaves, as in the Tiger lilies. But in the south they are found five or six inches in the ground, evidently feeling that they must get down to the region of coolness and moisture, and, in cultivation, when planted comparatively shallow, or in a dry, warm soil, they are subject to disease. That is one of the central points in the cultivation of the lily, and then, too, they usually like very rich soil. It is almost impossible to have the soil too rich for lilies. In the woods or swampy places where they are usually found there is generally an immense quantity of decayed vegetable matter. The richer the soil is with such matter, provided it is entirely rotten, the better they thrive. It is important to bear in mind that the manure must be thoroughly rotted, for all lilies are very liable to suffer from parasitical fungi, and there is more disease in vegetation from such causes than is usually thought. This occurred to me in the discussion of the peach this morning. The peach is especially subject to catch fungoid evils from the fungoid communications surrounding it, and when we find plants especially liable to catch fungus from contact we have to be more careful. In the case of the lily, which is also peculiarly subject to fungus attacks, it is very essential to have the manure utterly decayed, because there is a great quantity of fungi in manure not thoroughly rotted. Thoroughly decayed manure is free from them, because the fungus plant has already exhausted itself, and there is, therefore, no temptation to reproduce itself on the lily or other roots. The Japanese and Chinese, who, with all their inferior civilization, are further advanced in some practical matters than we are, are well acquainted with this fact; and in the lilies they send to us, they are very careful to keep them from contact with substances liable to produce fungus growth. They take clay and cow manure and mix them up, and cover each bulb entirely with the mixture, so that the atmosphere is excluded, and there is no chance for the fungus growth. The general public have wondered why the Japanese coat their bulbs in this way. Very few people understand it, but this care to avoid fungus is the reason. On the other hand we keep them as we always have kept them, and they become diseased. We do not learn from the Japanese, and, notwithstanding thousands of such lilies are brought from Japan every year, they mostly die after a year or two of our treatment.

There is, of course, a great deal that might be said about the cultivation of lilies under glass. Thousands are forced annually, in order to produce the flowers for weddings, festivals, and other joyous occasions. But I suppose it is hardly necessary to go into that on this occasion.

A matter of perhaps more general interest is the propagation of the lily. Very few understand how to propagate them. They plant lilies in the ordinary way, and they find that after one or two years from one or two plants they may have three or four. But the florist understands the secrets of the bulbs. He separates the scales, and from each scale a little bulb is formed, and by planting those scales in proper conditions, not too wet nor too dry, they grow, so that from one plant a florist is able to have many thousand in a short time. But in a general way, their propagation is arranged for in the manner in which most people arrange it for other flowers.

Thus I have endeavored to trace to you some matters of interest connected with lilies. I wish to show, chiefly, that we do not live altogether for what we take from the orchards and fields, but for the beauties and the comforts of life. And I have endeavored to show, among other lessons, the great value to us that may be derived from the study of the lily; and my object was to show the great wisdom of a society like this in not confining itself merely to what are termed mere money-making or practical questions, but to go out to those which seem to be incidental, because the many lessons which they teach us re-act upon the primary one for which societies like this are usually formed. (Applause.)

Mr. BALDERSTON. I hope the Association will appreciate the importance of these remarks, and I am glad we will have a reporter to take them, that they may be printed in full. These ideas, if applied, give us the reason why plants that are forced too soon do not bloom so freely. They need time to rest, and when they grow slowly their bloom is more beautiful.

CHANGING THE NAME OF THE SOCIETY.

Mr. CALDER. It is nearly twelve o'clock, and at our session last evening I stated that the committee appointed to confer with the Attorney General would have an interview with him at nine o'clock this morning, and report this forenoon. Mr. Edge, Mr. Meehan, and myself called this morning, and the Attorney General, through his deputy, stated that not being organized or chartered under any State laws, there would be no difficulty in changing our name at all, as our relations to the State would remain the same. We can take any name we choose, and if the State Printer will consider us the same society as we were before, there can be no difficulty in the way.

Mr. MEEHAN. Such being the case, there seems no necessity for further action. This matter has been before the Society some three or four years, and at our last annual meeting it was voted unanimously to change our name, unless there were legal or other obstacles in the way. There being none, our decision of last winter must be considered final.

Mr. SATTERTHWAIT. I think it is not too late to reconsider our action, and allow a vote upon it now. There seems to be some opposition to a change, and I think we should have an opportunity to vote upon it.

Mr. CALDER. If I understand rightly our action in this matter, our name is now changed. If we wish to change again, and call ourselves the "Pennsylvania Fruit-Growers' Society," we must re-adopt that name by a vote of the majority. I move, Mr. President, that the State Horticultural Association of Pennsylvania do now adjourn.

Adjourned to two o'clock.

AFTERNOON SESSION—Thursday.

TREASURER'S ANNUAL STATEMENT.

The following is the annual statement of the Association's financial condition, together with the report of the auditing committee to which it was referred:

George B. Thomas, *Treasurer, in account with Pennsylvania Fruit Growers' Society:*

1881.			*Dr.*
Jan 19.	To cash on hand,	$323 20	
19 to April 19.	To cash for annual dues,	52 00	
			$375 20

1881.			*Cr.*
Jan. 19.	By cash paid George D. Stitzel, bill B. F. Owens, for cards and express same to State fair,	$1 25	
20.	By cash paid E. B. Engle, salary, stamps, express, &c., as per bill,	49 89	
	By cash paid E. B. Engle, expenses of J. H. Funk as judge at State fair, 1880,	7 20	
	By cash paid E. B. Engle, expenses of Henry M. Engle as judge at State fair, 1880,	9 11	
	By cash paid E. B. Engle, bill of Urie B. Engle, printing, &c.,	7 50	
21.	By cash paid R. Sherfy, express on fruit to Charles Downing,	1 00	
Feb. 19.	By cash paid R. Sherfy, for drawing fruit as per bill,	2 00	
			$77 95
	By balance,		297 25
			$375 20

1882.		
Jan. 18.	To cash on hand,	$297 25

To the President and Members of the Fruit Growers' Society of Pennsylvania:

The undersigned, your committee appointed to pass upon the report and vouchers of George B. Thomas, Treasurer of the Society, respectfully beg leave to report:

That having examined the report in connection with the vouchers therewith to us exhibited, find the charges therein regular, for legitimate purposes, approved by the proper officers, and the balance therein mentioned the actual balance in his hands due the Society. All of which is respectfully submitted.

HOWARD A. CHASE,
BASSLER BOYER,
JOHN G. ENGLE.

January 18, 1882.

The committee appointed to examine and report upon the fruits on the tables of the Society, submitted the following:

Mr. J. V. Garretson, Floradale, Adams county, Pa., seven varieties of apples; good specimens, some very good.

William Voris, Pottsgrove, Northumberland county, Pa., two varieties of apples; one of them, the Major, very fine, and said to be a valuable variety for that section where it originated.

Levi Beist, Lancaster county, one dish of apples.

George Balderston, Cecil county, Md., seven varieties of apples.

H. M. Engle & Son, Marietta, ten varieties of apples.

George Achelis, West Chester, one plate Pyle's red winter.

Alf. S. Sheller, Lewisburg, one plate Major apples.

H. A. Longsdorf, Mechanicsburg, forty-eight plates Virginia apples.

Raphael Sherfy, Gettysburg, one plate Salem grapes.

H. C. Snavely, Lebanon, one plate Facht apples.

J. C. Hepler, Reading, one Reading pear.

H. A. Longsdorf, Lawver apple, long keeper.

J. V. Garretson, Floradale, seven plates apples.

Dried Fruit.

Two plates of apples evaporated by American Drier Company.

Two plates of peaches evaporated by American Drier Company.

One plate of corn evaporated by American Drier Company.

J. D. Brenneman exhibited twenty varieties of fine Primroses.

Also plate of Gloub Merceau pear and Florida oranges by Peter Lint, York.

Submitted by the committee.

H. S. RUPP,
ED. SATTERTHWAIT,
ALPHEUS S. SHELLER.

Messrs. Longsdorf, Heister, and Woods were appointed a committed to make a selection of fruits from those on exhibition, and send the same to Charles Downing.

Mr. H. M. ENGLE offered the following, which was adopted:

WHEREAS, Very valuable reports of horticultural societies of other States, received in exchange of ours, have accumulated in the hands of the Recording Secretary; therefore,

Resolved, That a committee be appointed to consider the propriety of establishing a library for the benefit of this Association, said committee to report at our next meeting.

The following were appointed by the Chair: Messrs. H. M. Engle, Calvin Cooper, and Dr. James Calder.

Mr. CARTER offered the following, which was unanimously adopted:

Resolved, That the thanks of the State Horticultural Association of Pennsylvania are eminently due and are hereby tendered to Hon. Thomas J. Edge, Secretary of the State Board of Agriculture, for the generous use of his office-room for our present meeting, also to the committee of arrangements, and the janitor of the public buildings for their careful attention to our comforts.

Mr. SWIFT offered the following, which was also unanimously adopted:

Resolved, That a committee be appointed to prepare parliamentary rules to facilitate and expedite the transaction of business coming before this Association, or to select a suitable manual of parliamentary usuage to be used by this body, and report at our next meeting.

The following were appointed on said committee: Messrs. Swift, Boyer, and Pannebaker.

The following paper was then read:

SHOULD FRUIT GROWERS ENCOURAGE BEE-KEEPING?

Mr. President and Gentlemen of the State Horticultural Society:

At the request of an aged and honored member of this Society, I propose to write upon the much-mooted question of fruit and bees, and offer a few observations upon the interrogative: Should fruit growers encourage bee-keeping?

As a rule, all essays written in the form of a question are answered in the affirmative. This I desire not to do, further than is warranted by my own unbiased observations.

Almost simultaneously with fruit growing I associated kee-keeping, not, however, without doubt as to its propriety from what I had previously read. Believing, however, that our All-wise Creator made all things for a wise and useful purpose, I at once concluded to investigate the question of fruit and bees. The first fact that we notice is the love the bee has for the nectar and pollen of all kinds of fruit blossoms; its assiduous visits, crawling over stigma and anthers, dipping here and there for nectar, patting the pollen upon the thighs, passing swiftly from blossom to blossom, carrying pollen from anthers to stigma, and never visiting but one kind of blossoms on the same raid.

Here the question arises, are these assiduous visits intended to benefit the bee, or is it not one of the great designs to bring about fruitfulness? Is not this little insect filling a place for the benefit of man, both in fruitfulness and in the increase of the colony, to assist in gathering a richer harvest in midsummer? We do not claim that the bee is the only agent to assist in fertilization. There are many other agencies. There are two facts that we have noticed, viz: That a bee will never visit an open blossom that has been injured by frost or cold; and that fruit never fails to set well where bees have reaped a rich harvest from the blossoms.

After fruit blooming the bees turn their attention to other fields of pasturage until the fruit matures or rots. Here is where many fruit growers complain. The cry is "the bees are eating my peaches, plums, or grapes," as the case may be, and in one sense they are right. Countless numbers are "diving" into the fruit—and here we investigate.

Hale's Early peaches are swarming full, fruit not ripe but rotting. Every bee stops short at a rot spot. Remove every peach that is not sound. The bees run over the balance of the fruit in a wild and apparently frantic manner, then off to another tree they go and alight upon the first defect they find. Early York comes in, fruit sound, no bees about. We pick for distant market. In two or three days some are quite ripe; the bees are feasting upon them; we take off all unsound ones as before, and the bees hunt frantically, never stopping to gnaw or make an entrance, but off to another tree they go. Several years ago, when the new very early varieties of peaches first ripened on my grounds, I had a very decided test with the bees on two early Alexander trees. I took off all apparently defective fruit. The bees had no other resort; they carefully examined every peach left, never stopping except where the skin was broken. Although I had some trouble in saving the fruit of this variety, I failed to detect a bee tear a solid rind. The tenderness of the rind and slight disposition to rot, coupled with the depredations of other insects, were the first causes that gave me trouble with this variety.

My bees have eaten grapes for me, but not every season. Those seasons were not confined to scarcity of bee pasturage, nor the kind of bee, Italian, Hybrid, Black, or German. I observed the same manner of seeking broken places in the skin of the grape as in the peach. I have never yet seen a bee sit sparrow-like upon any kind of fruit, and tear a solid rind. I am convinced that ripe fruit, that the bees are so found of, should have been disposed of in some manner before the rising of that day's sun. Grape skins, that bees have emptied of the pulp, are nearly all slit from end to end. If the bees slit the grape skins, why do they make a circular entrance into the peach? If they tear the grape, why do they not go at it at once, instead of running frantically over it? I have found when the bees were busy at the grapes, that most bunches had fermented berries distributed through them, which indicates unsoundness from some cause in the skin of the fruit.

Gentlemen, I have tried not to let my love for the honey bee get away with me. I have frankly given you my observations and experience. How do they accord with yours? Have I made incorrect observations or deductions? I ask to be corrected. We meet for the purpose of learning, presenting and discussing facts. If you have any suggestions on this that is written, let us have them. This question should not be answered by guessing. The honey bee has been guessed at (except the sharp end) for centuries.

From the construction of the bee's mouth some of our most observing bee-keepers doubt the ability of the bee to bite or tear a solid grape skin, if they desired to.

Professor A. J. Cook, Professor of Entomology in the Agricultural College, at Lansing, Michigan, writes me under date of January 6, 1882: "I still think it impossible for bees to tear grapes, not only from anatomy but from a long series of experiments." An opinion of high authority for all bee-keepers certainly, and fully accords with my own experience as a bee-keeper. A well-conducted series of experiments by other well-known apiarians might also be cited as proof of Professor Cook's opinion, but proper space to detail them cannot here be spared.

In seasons when fruit is a failure we can grace our tables with the best of honey. I find no reason as yet, except that of over-work, to prevent fruit-growers from keeping from ten to twenty or more colonies of bees. I believe that bee-keeping, when properly understood, will go hand in hand with fruit-growing. The keeping of bees is a fascinating as well as healthful pursuit. There is no branch of husbandry that pays a greater per centum on capital invested than that of bee-keeping when followed with proper knowledge of the subject.

The science of apiaculture has advanced wonderfully the past twenty-five years. We have five standard works on the honey bee, and one weekly and six monthly papers now published in the United States. We need not "go it blind," as our parents were obliged to. We can begin intelligently, blend our pursuits, and reap the sweet and rich harvests of nature.

RAPHAEL SHERFY.

GETTYSBURG, PA., *Jan. 17, 1882.*

Mr. SATTERTHWAIT. I kept bees until last season. Found them very destructive to fruit, and was glad to get rid of them. I saved, at least, $500 on my crop of fruit last season.

Mr. ENGLE. This question has been discussed, pro and con, for years and seems still undecided. I consider the essayist one of the most competent as well as impartial men on this subject. He is an extensive bee-keeper as well as a practical and observing horticulturist. The question is, have we positive evidence that they ever open or puncture the skin of any fruits. I cannot say that I have seen them do it. If Mr. Satterthwait is positive he has seen them do so, we have conclusive evidence.

Mr. MEEHAN. Anyone who wishes positive evidence on this subject can obtain it at Germantown. There is scarcely a home without its grapes, and plenty of evidence that they are destroyed by bees. Bumble bees are known to slit long-tubed flowers in search of honey. Where bees are numerous and flowers scarce, grape will be attacked and vines will be stripped entire.

Mr. EBY. I have the testimory of three men that bees are destructive to fruit. Mr. Metzgar, north of Lancaster, a successful grape grower, told me two weeks ago that he feels disposed to root out his grapes on account of the bees. Mr. Metzgar has watched them on perfect grapes, and has seen them puncture and open the skins. Mr. Frank Diffenderfer, who has been an advocate of bees, is now convinced that they destroy grapes. Mr. Hensel, a florist of Lancaster, has rare exotic plants, and he informs me that bees go there and slit the flowers to obtain the honey.

Mr. LONGSDORF. My own impression is that bees are destructive to fruit. We had a case in an adjoining town where they became so numerous that the citizens appealed to the courts for protection. The result was the bees were convicted. It was testified that they came into kitchens and drove out the inmates.

Mr. SWIFT. It would be interesting to know whether they will attack fruit when flowers are plenty. Would it not be advisable to plant linden trees for them?

The PRESIDENT. My experience is similar to that already heard. Bees did not annoy us much until we put up a press for cider. When apples were scarce they attacked grapes and destroyed them until we resorted to putting them into paper bags.

Dr. CALDER. We had a case here in Harrisburg similar to the one referred to by Mr. Longsdorf. One of our grocers, who also manufactures candy, was much annoyed by a neighbor's bees, and brought suit. Our court decided that they were a nuisance and must be removed at the owner's expense. In reference to paper bags for grapes, I have also had some experience in that direction. I bought last summer one thousand two-pound manilla bags and had them put on when the grapes were about the size of buck-shot. They were put on with pins, and the total cost for bags, pins, and labor was about ten cents per hundred. They were left on until the fruit was ripe, and upon examination I found none of the grapes injured by insects. I was surprised to find them in such fine condition and so well covered with bloom. They were, perhaps, not so fully ripe as those not covered, but that was an advantage, as the fruit was more perfect, and came into market when the glut was over and realized better prices. This did not unfavorably affect the flavor of the grapes. I will try the plan much more extensively next year.

The PRESIDENT. I tied bags with strings and put them on only a week or two before the fruit began to color. If any difference, think it improves the quality of the fruit.

Mr. ENGLE. I attended last week at Vineland the annual meeting of the New Jersey Horticultural Society, and this was one of the most interesting questions discussed there. Rot is quite prevalent there, and they find bagging a preventive. To prevent rot they advise bagging early. As to quality, some thought bags improve the fruit, others thought not. One good man or boy will bag five to eight hundred or even one thousand in ten hours. If this method is found to prevent rot, insects, &c., it will pay well.

The following essay was next read:

HORTICULTURAL FERTILIZERS—WHAT ARE BEST AND CHEAPEST AND HOW APPLIED.

By JOHN I. CARTER, *Chester county*, *Pa.*

When your worthy Secretary referred the above subject to me, I presume it was expected that I should be able to suggest, with some degree of authority, some special fertilizers especially adapted to our wants as horticulturists. If such was the case, I fear I shall disappoint him; for though the theory of a special fertilizer for each particular crop is a very plausible and comfortable one, yet in my experience it is not at all reliable.

Past experience with our teachers of agricultural chemistry, somewhat verifies the old adage " That a little learning is a dangerous thing," as shown by the amount of money wasted by farmers in following their specious theory of soil-analysis, as a reliable guide for the selection of fertilizers, and their still later teachings, that a special fertilizer can be formulated upon the chemical analysis of a growing crop or plant! As tillers of the soil, we are greatly indebted to scientists for help in many ways, but there are yet many unrevealed mysteries in the bosom of mother earth that defy the wisest of our scientists, and, that often mar the practical proof of their fine spun theories. For instance, we may determine very accurately the amount of nitrogen, potash, and phosphate in the grain and straw of a forty bushel crop of wheat, and with some degree of certainty the apparent amounts of these ingredients in the soil. But we have seen a difference of fifteen or twenty bushels of grain and a ton or so of straw, made by an application of two hundred and fifty pounds of guano per acre—the guano containing only two pounds each of ammonia and phosphate, and distributed through six inches depth of soil—making a quantity so infinitesimally small, compared with the bulk of soil with which it is mixed, that the nicest of tests would fail to detect it at all. Hence we must naturally conclude that there are other agencies at work in the soil that have not entered into the calculation, and that with our present light cannot be accounted for. Again we might ascertain with reasonable certainty, that an acre of apple trees would take from the soil in its growth of wood and apples, a certain number of pounds of potash, yet nothing but a practical trial, after all, will determine whether it is necessary to apply potash to each individual orchard. There may be plenty of it in the soil. It may be active or latent. Individual experiments only can solve these questions. While I had charge of the

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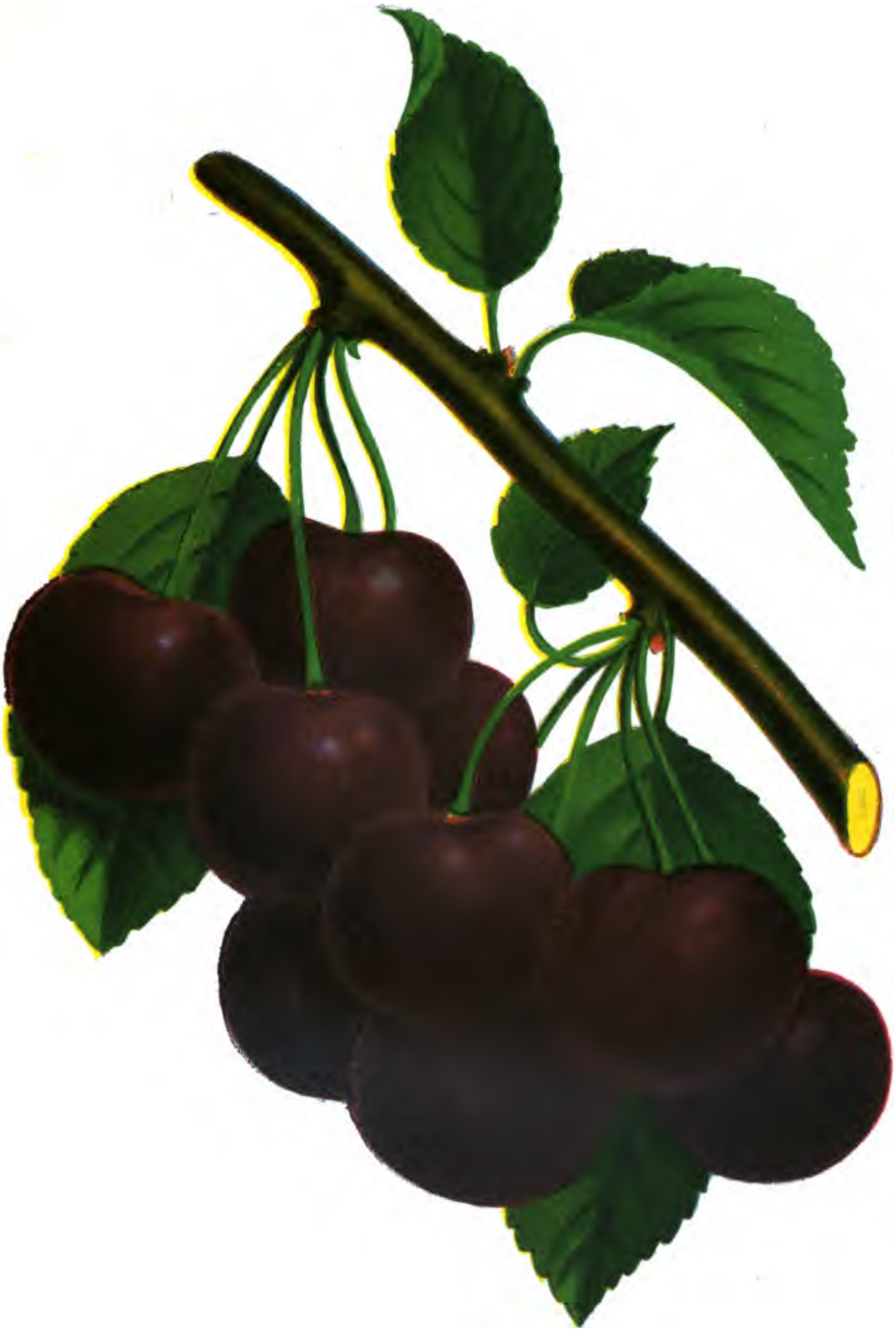


THE TRIUMPH OF CUMBERLAND CHERRY

ORIGINATED IN CUMBERLAND CO PA.

FINE DELICIOUS FLAVOR, A PROLIFIC BEARER, AND RANKS WITH THE BEST.

experimental farm in Chester county, I made several thousand experiments with fertilizers upon all the crops usually grown upon a farm, including horticultural crops, and in a large majority of cases, the fertilizer richest in soluble phosphate of lime, gave the best results. And it was also shown that the fertilizer that did the best for corn, was likely to do best for all other crops, if applied in a manner to suit the especial cases.

The soil, then, evidently stood in most need of phosphoric acid, and hence the application of that manurial element really enriched the soil, by establishing a proper balance among the plant foods, and thus aided all kinds of plant growth. Different crops require different modes of application.

Growing trees or small fruits should have the mineral fertilizer applied in the spring and plowed down, where plowing is possible. It is thus prevented from being washed away, has a good opportunity to be thoroughly dissolved by the action of the moisture and solvents in the soil, and is ready to start a vigorous spring growth that will be healthy, and mature, even if it is luxuriant, because it has the whole season to perfect itself. What we call immature wood-growth, is more frequently the result of a *late* or *unseasonable* growth, than because it was too luxuriant. But heavy applications of nitrogenous manures are sometimes dangerous, not so much because of the rapid or strong growth made, so much as the temporary nature of this kind of manuring; the stimulating supply is exhausted before the plant is perfected. The safest general recommendation of a fertilizer for orchards and small fruits, would be a well-dissolved raw bone, or a good acid phosphate, these being likely to meet the wants of a majority of cases.

In the bone we usually have from three to four per cent. of ammonia, which might be useful in some cases, as an excitant to early growth. But the acid phosphates, or dissolved South Carolina rock, furnish the phosphate in a cheaper form than we can find it in a pure bone fertilizer.

I feel safe in making the above recommendation, because, to a certain extent, it involves the use of the plow, which, in itself, in most cases, is a judicious thing to use. A well-cultivated orchard or fruit garden, where the soil is made loose and fine, freely admitting the rays of light and heat, absorbing moisture and ammonia from the atmosphere, the whole strength of the soil going to the trees and shrubs, and not to weeds and other crops —is certainly standing a better chance than one standing in grass, waiting for the very uncertain prospect for the few loads of barn-yard manure the farmer may have left from his regular crops. We do not mean to discourage the use of barn-yard manure by any means. It can seldom come amiss, particularly if applied in the late fall or early winter. Any covering of vegetable matter, sods, or composts, that will smother the grass or shade the ground will mellow it, and enrich it by the fertilizers it may contain, and by increasing its absorbing power be benefited by the air and light.

Potash would naturally suggest itself as a special tree food, and it would certainly be wise to give it a thorough trial—especially as potash is now not only cheap, but easily obtained. The muriate of potash, showing a per centage of ninety per cent. of the pure salt, can be bought for about sixty dollars, or Kainit, the German dung salt, showing thirty to forty per cent. potash, can be bought for sixteen dollars. Either of these goods are furnished by the trade, and can readily be got. I think, sometimes, that the value of ashes is often over-estimated, particularly when we judge by the effects of burned brush heaps. The good results are as often due to heating the earth as from the deposit of ashes. In summing up all I have to say on this subject, I would give this advice: "Stand not on the order of your manuring, but *manure*." You are more likely to err "In the breach than in the compliance." The farmer's orchards and fruit gardens, though highly important adjuncts to the farm, are too often made entirely secondary when the annual distribution of the manure pile takes place. We seem to expect from our fruit trees what we could not from any other crop—a persistent yield without adequate manure. An attempt to raise successive crops of grain upon the same field without manure, would be deemed the height of foolishness. Yet we seem to expect our apple trees to yield ten times the weight of fruit that our fields do of grain—and do it, too, with very infrequent manuring. I regret my inability to treat this subject in the manner expected, and failing to tell you *how* to manure, or with *what*, must content myself with commending you to put on plenty of *something*.

Mr. **Pannebaker**. Have had some experience with ashes and found them beneficial in orchard culture.

The **President**. My experience is that wood ashes are always good for cereals and fruits. I apply at the rate of about four tons per acre, and spread broadcast.

Mr. **Voris**. A few years ago I applied old chips and refuse from the wood pile to an orchard, and thought it did more good than anything I ever applied.

Mr. J. C. **Hepler**, of Reading, Pa., read the following essay:

FRUITS AND VEGETABLES—THEIR CULTURE.

Mr. **President**: As we have met once more to have a friendly talk on fruit, its qualities and cultivation, I will give some of my experience. With persons of experience, as well as with beginners, it is very difficult to know what to select, as there are so many kinds in the market and each person thinks he has the best varieties. There is also such a quantity of fine fruit brought in for sale as to surprise one into wondering where it all comes from; but, considering the thousands of persons that are in the business, the quantity of each kind is not so great after all. There is too much that is only passable, which spoils the sale of the finest quality, for in twenty years' experience I found about only ten per cent. of my customers were willing to pay a fair price for fine fruit; they all preferred it, but at the same time a cheaper fruit sold best. It is the common and poor fruit that is the most expensive, but most persons will not believe it. It is the *quantity* they want, not the *quality*. Now if we did not have to pay so dear for our experience, we could afford to sell fine fruit cheaper with a profit, but when one must wait years for the trees to bear and then be disappointed with the fruit, it is poor encouragement. Many persons will sell their fruit for just what they can get, while others top and graft their trees, which has been my way with most of the trees I have bought. I was often discouraged, and thought I was the only one cheated by tree agents, but find others were in the same boat with myself. Some years ago a nurseryman in our town received several hundred trees from a New York firm with most of the labels lost. He sold them as they were. I bought a dozen and grafted all but one, (the finest in the lot,) and that turned out to be nothing but the poorest kind of a seedling. The worst of it was there were others heard that he was selling them cheap, who bought them all just as he sold them, and when persons asked them for certain trees "O yes, they had them in the nursery," they would label them as they wanted them for their customers. I have seen at least fifty of them come into bearing, and nearly all worthless. The trouble is we have too many tree agents; all anxious to sell and not at all conscientious about what they sell; for, as one told me, "that before the trees came into bearing the labels would be lost, or the property change owners, and no one would know where they came from or what they were bought for." I have bought more poor trees than good, but, as I said before, when the fruit is not good, I either plant other trees or graft them. When I have small fruit that does not suit my soil, I drop them out of cultivation and keep up with those that do. Out of fifteen or twenty kinds of strawberries I have laid aside all but three, namely: "Charles Downing," "Wilson's Seedling," and the "Sharpless," which beats all I ever had for *size*, but not for *quantity.*

I have also discarded all raspberries but the "Philadelphia," "Clarke," and the old "Antwerp." The two last named went back on me last summer, whether on account of the drought or not I cannot say. In regard to currants, I have very few besides the Cherry currant, which bears exceedingly well and sell for two cents a quart more than the smaller ones, to those of my customers who appreciate good fruit. One of them (a gentleman) was persuaded to buy some grape vines, which were to be something extra. I planted with great care and watched them until last summer, when the one that should have been the Lady grape was one of Rogers' light grapes, and the others were only common dark grapes, not to be compared with the Concord or Union Village. The latter, in my estimation, is a No. 1 grape, as it will remain on the vines longer than the Concord without dropping. Among apples, the Baldwin, Spitzenberg, Smokehouse, Krauser, Northern Spy, Greening, and Golden Pippin are the best for winter marketing, as they always sell and give entire satisfaction. I would not advise the keeping of too many varieties, as they need considerable attention. As a general rule, *tenant* farmers pay *too little* attention to their fruit. Instead of studying its nature and trying to improve it, they allow it to take its own course, whether from carelessness or ignorance I know not. I frequently see apples for sale that are quite out of season, and would pay the owners much better if they kept them a little while longer, even at the risk of some decaying. In our section, last year, the apple crop was a failure. Judging from the display at our county fair, what few trees did bear produced fine fruit. I have observed that when we have an extra heavy crop of apples and pears one year, the next is very light, for then the trees do not produce the bearing-spurs but require all their strength for the fruit. The "year off," as we call it, is their rest; and then the bearing-spurs are made for the following year. This you will notice holds good in all cases, unless we have too much heavy rain in the blossom season, which will destroy the crop.

We had no peaches in our neighborhood. Instead of the blossom being frozen, I think the trees were exhausted from over-bearing the year before. Having two or three trees exposed to the northern winds and storms, which bore a few peaches, proves that the blossoms were not frozen. Although we are in the coldest place in the neighborhood, I never saw the peach trees make such a vigorous growth, and I think simply because they had rested from fruit-bearing last year. It is my belief that we will have a plentiful crop this year. If not out of place, I would like to recommend our farmer friends to plant trees along the road, and at intervals along their line and partition fences. Fruit trees have been suggested, but I would not recommend them, as our boys, and even men, do not respect personal rights to such property, and a man would be worried more than the fruit would be worth. Walnut trees, if planted at a distance of fifty feet, and a little attention given them at first, to start them straight, in six or eight years they will bear, and the nuts will pay for the gathering. In fifty years the trees will be worth as much as the farm, providing they have been trained to grow straight. I am sure he that can imagine a fine row of trees around his farm, will start to planting this winter, as the nut must be planted in the fall, so that the shell will burst by the action of the frost, to give the germ a chance to grow. To him who has low or bottom land I would advise the planting of Shell-bark hickory, as it is becoming very scarce, and in good demand. I was told by a man, when in the spoke-manufacturing business, he used, on an average, two hundred acres of hickory-wood a year, and that he bought trees worth ten dollars each; which proves they are worth the little attention they need at the outset. There is one more tree I would like to bring to the notice of those who do not fancy the walnut. The Tulip poplar, that fine, majestic tree which naturally towers to the skies, and is the admiration of all, especially when in blossom. They are fast growers and will repay the planter. Most of our nurserymen have them for sale, from ten to twenty-five dollars per hundred. The larger size are the best to plant, as it is so much time gained. I have bought some very fine trees from Hoopes Brothers & Thomas, whom I know will be pleased to serve any one who may call on them. If the walnut alone is not preferred, it may be used alternately with the poplar, which will make a novel appearance, and provide a chance for observing the difference in the growth and habits of both. There is much to say about forest trees; but as that is not my subject, and I have already trespassed on time, I will hasten on.

In the vegetable kingdom we do not have so many improvements as in fruit, and therefore there is not so much to say on this subject. We have many varieties of vegetables of the same kind; still, a cabbage is a cabbage, and so a radish is a radish; but there are the early and the late varieties, the strong and the mild, the large and the small, the sweet and the sharp. To take each one separately would be tedious, so I will only say, that during my experience I have found more in the name than in the reality; also, that good, fresh vegetables are a luxury. Most of them when brought to our markets are too stale for use, especially those brought from abroad. As a general thing, our home gardeners (who *do* bring us fresh vegetables) are not sufficiently paid for their labor, as it costs too much to raise them, besides being some weeks later than those brought from a distance, and prices by that time are low. Every Berks county farmer has a garden, some a very large one, and all extra vegetables they sell, is so much gained; but whether the soil is adapted to gardening is seldom considered; if only their vegetables *grow*, it matters not *how*. I do think two thirds of our market gardens are out of place. In my observation I find that most persons will take any place they can get, regardless of soil, location, or water, and embark in raising vegetables; consequently, after several years' trial they fail and become discouraged in their work, and seek some other occupation. Were we dependent on the market gardeners alone, we would often fall short. But thanks to those farmers who always have what they call "luck," we do not fall short. I think a person wishing to engage in the truck business should select low ground near running water, for then the summer drought would not affect them so much, as the night air is damp and the mist from the water all help to dispel the dry atmosphere and assist vegetation. After location comes the selection of seed, which is a very important part. If you want early vegetables, it would not do to buy and plant late kinds that take nearly all summer to grow. I have planted to try the difference of seed in red beets, and have found that the early beet could be taken up at the end of eight or ten weeks, while the "Long Late" require five months, and when the late variety were in their prime, the early variety were tough and stringy. So with cabbage, what is intended for early must be planted early, or it is a failure. Many persons think a bean is a bean, as far as planting is concerned, but that is a mistake. All have their time, quality, and hardness. Some will stand a frost, while others by their side will be killed by it. As above mentioned, I think the selection of the seed quite as important as the ground. To be *successful*, it is necessary to be well posted on the time of planting and what kind to plant first. I do not wish to advertise, but would say that Mr. P. Henderson's book on Gardening for Profit, is the best I have ever seen and read; even then one must take one's own soil and location into consideration, for his location does not suit all; at the same time I would advise any person wishing to raise vegetables for profit to get the book, as it is a good guide. This having been a poor season and vegetables at a high price, many may be tempted into the business, but unless they are well acquainted with their soil, seed, and location, they will fail. At the present time I can count at least twenty-five persons who started the farm and truck business when I did, and all but one or two have left it for want of success, simply because their soil did not suit, and their experience was not sufficient to see them through. I would just advise any one going into the business to select the proper soil, location, and seed, making frequent use of the fertilizer, working the ground to its best condition before sowing the seed, and I do not think he will fail. Many are afraid if they use to much manure the strength all goes in the tops and not in the vegetable, but they are mistaken. If the ground is too poor to make tops, it is too poor to produce vegetables. The better fed, the better will be the profit for its owner, and the earlier they are taken to market, the better they will pay. I have sold tomatoes for five cents a piece in March and April, when I could not get that for a quarter peck in July and August; the same with lettuce, radishes, and all other vegetables. He who wishes to profit by raising vegetables must be wide awake to his interests, and without hot-beds, he will be left far in the rear of his neighbor who has them. They must be made to produce from two to three crops a season, or they will not pay. I hope the advice here given will be of benefit to some who are interested in "fruit and vegetables and their culture."

On motion of Mr. HOOPES, the Society proceeded to name a place for the holding of the next annual meeting.

Mr. SHARPLESS named Catawissa. We are easy of access by rail, have two hotels, and if they cannot accommodate all, private houses will. We will furnish a hall free. We have a number of fruit-growers in the vicinity, and think a meeting there would be well attended.

Mr. PANNEBAKER. I would suggest Lewistown. We can have the court house, and have good hotel accommodations. We will have ten persons attend the meeting to one here, outside of the regular members.

Dr. RYDER named Chambersburg.

Mr. HOOPES. We were disappointed at Williamsport a few years since. Think it best not to go too far from where most of the members reside.

Mr. ENGLE. There are several points to be considered in deciding this question. I think we should endeavor to have other portions of the State represented in this Association. I would like to have members from every county in the State. We will probably have a better attendance of old members in the eastern part of the State, but by going west or north we may get more new members.

Mr. **PANNEBAKER**. Lewistown is near the center of the State, being half way between Pittsburgh and Philadelphia. I am the only member there, but a number of our citizent have promised to assist in getting up a full meeting.

Mr. **EDGE** named Harrisburg, and tendered the use of his office again.

Mr. **SATTERTHWAIT**. I am opposed to going to out-of-way places. I am satisfied that Harrisburg is the most convenient and accessible point.

Mr. **SHELLER**. I think by going to Lewistown we might get additional new members. We have a railroad from Sunbury to Lewistown, and could come *via* Northern Central railway.

The question being called, Harrisburg was selected by the following vote:

Lewistown,	9
Catawissa,	9
Chambersburg,	1
Harrisburg,	18

The list of standing committees for 1882 was then read by the Secretary.

Mr. **ENGLE** referred to the work and duties of the members of the General Fruit Committee and Committee on Nomenclature, and hoped they would assist their respective chairmen in making full and satisfactory reports. The work should not be delayed until next winter, but notes and observations should be made throughout the summer and fruit season.

Mr. **SHERFY**, chairman of Committee on Nomenclature, asked the members of his committee to correspond with and keep him posted in regard to matters relating to their committee.

Mr. **LONGSDORF** inquired whether the cultivation of Russian varieties of apples has proven profitable in Pennsylvania.

Mr. **SATTERTHWAIT**. At least five hundred different varieties have been brought to this country for trial. So far as I have seen them fruited they are worthy of cultivation, and I have no doubt some of them will become valuable acquisitions.

Dr. **CALDER**. Have seen them tried in Wisconsin and Minnesota, and so far as tested they prove satisfactory. They produce fine fruit, and seem admirably adapted to those localities.

THE QUERY BOX.

The following questions from the query box were then read. Some of these were discussed in order and at length, some very briefly, and some not reached:

1. Is the white mulberry the best variety for feeding the silk worm?

2. Is the Ridge Pippin a good Pennsylvania apple?

3. How shall we utilize our wasting fruits, so that fruit-growing may be profitable?—D. E. LONGSDORF.

4. What about the following new fruits?

Kieffer pear, and other seedlings of the Chinese Sand pear.
Miner, Bassett, Yosemite, Weaver, and Wild Goose plums.
Marengo and Tetofsky apples.
Waterloo peach and Champion quince.

5. What are the really good late winter pears?

6. Would the establishment of fruit-canning factories among us benefit fruit-growers?

7. What is the best season for pruning maple trees?

8. Has any member had experience with the Wheatland peach?

9. Is A. Boardman's paint a safe and sure preventive for the peach and apple borer?

10. Are there any sections of this State exempt from the attacks of the apple root louse, that for forty years has caused more or less trouble and loss to the nurserymen, especially in the seed-bed and nursery row?

In answer to the first question, Dr. **Calder** and Mr. **Sherfy** stated that white mulberry were considered best. Mr. **Meehan** stated that osage orange is also considered good.

SECOND QUERY.

Mr. **Satterthwait**. With me Ridge Pippin is next to Smith's Cider, my most valuable market apple. It is a good grower, bearing uniformly all through the tree, though never over-loaded. It is not a very sweet apple, though too sweet for some.

Mr. **Thomas**. It is not of extra quality, but a good keeper and a good yielder.

Mr. **Strode**. I find it a profitable market variety.

THIRD QUESTION.

"How shall we utilize our wasting fruits so that fruit-growing may be profitable?"

Mr. D. E. **Longsdorf**. Our discussions thus far have been confined chiefly to questions pertaining to the growing or producing of fruit. This is only half way, and we should consider also how to utilize it when we have it. Very often, for want of a profitable market, fruit is left to decay on the trees or rot on the ground, and not enough is realized to pay for the handling. Two years ago, when in Maryland, I was surprised to see the great amount of fruit that was wasted. One man informed me that every basket of peaches sent out had brought him five to ten cents in debt. The markets were glutted, and crops did not pay for picking, transportation, commissions, &c. It is not our heavy crops of fruit that pay, but the medium or light ones. It is a fact that half of the fruit in the United States to-day is not profitable. There are ways of utilizing this surplus and making it profitable. We should introduce the evaporator and the canning establishment. Good evaporated peaches never realize less than twenty-five cents per pound, and at present they will bring thirty-five to forty cents.

The **President**. This is a very important subject, and deserves our consideration. By canning and drying our surplus fruits, and introducing the modern fruit-houses, we can grow fruit profitably.

Mr. **Balderston**. We can also convert our surplus apples into concentrated cider, which is a merchantable article, and will keep a long time. It can be used with water to make a desirable beverage, and can also be converted into butter or jelly. One evaporator, twelve feet long, will convert eight or nine barrels into one in one and a half hours, or nearly as fast as it runs from the press.

Mr. **Longsdorf**. Two years ago I was in New York State two months during the apple season, and saw apples sold at fifteen cents per one hundred pounds. They were second quality picked apples, and if they had been evaporated and sold at a low price would have realized forty to fifty cents per bushel. When dried they can be kept for an unlimited time. The foreign demand for our dried fruit is increasing every year, and will take all we can spare. If kept free from insects it can be kept ten years.

Dr. **Ryder**. Have kept dried fruit ten years, but it deteriorates some. The great point is to keep it free from insects by putting in double paper bags. The moth will do its work in one night. Paper-lined boxes and barrels are also much used, and answer a good purpose.

Mr. **Longsdorf**. Another consideration in drying is that we keep our inferior fruit at home and do not glut the market.

Mr. **Sherfy** also recommended drying as the most profitable and economical methods of turning surplus fruit to account.

FOURTH QUESTION—DISCUSSION ON NEW FRUITS.

Mr. **Meehan**. In reference to the Kieffer pear, I can add but little to what I said at former meetings. I consider it a good pear and well worthy of cultivation. It requires care in ripening to bring out its best qualities. In the vicinity of Germantown it seems healthy and free from blight, but other varieties are also free from that disease in that locality. Some seedlings of the Sand pear show as much leaf-blight as any other, though they seem less subject to fire-blight than other varieties.

Mr. **Satterthwait**. I had only a few bushels of Kieffer pears the past season, and I consider it one of the most valuable of our new varieties. Its bearing qualities are wonderful. Young trees had branches with solid masses of fruit, all of which were well shaped and ripened perfectly. Some were put into a fruit-house for a few weeks, and when brought out were beautifully colored, and sold readily at twenty-five cents apiece and some at fifty cents. A branch was broken off when the fruit was about half grown, and the fruit being put away ripened and colored nicely. I think it is destined to be one of our most valuable market varieties. It ripens in October, and can be kept all winter in a fruit-house. In quality it is good, though not first-class. It should be picked as soon as fruit begins to drop.

Mr. **Engle**. I have seen and tasted the Kieffer pear and am pleased with its appearance and quality. I think a mistake was made in its introduction as a blight-proof variety. We have several instances on record of its being affected by blight, and I saw a case myself, in Lancaster, the past season.

Mr. **Sharpless**. I bought a tree two years ago, and it died last fall having every indication of blight.

Mr. **Lint**. On rich soil, and where trees grow too fast, they are more apt to blight than in poor soil. Have never succeeded in ripening Glout Morceau in twenty years.

Dr. **Calder**. At the State College, several years ago, a number of pear trees were attacked by blight, which seemed to travel in the direction of prevailing winds. I cut off the affected branches and destroyed them. I did the same thing in my orchard near Harrisburg, and in every instance the blight was arrested. Would advise the cutting off, at once, of the diseased branches and burning them.

NEW HARDY PLUMS.

Mr. **HOOPES**. Have fruited Miner plum three years. It has done well, bearing good crops every year. It is of the Chickasaw type, not first-class, but hardy and valuable. Have also fruited De Caradeuc, Langdon, and Wild Goose. Consider Wild Goose most valuable of the list. There are several varieties of it in cultivation. It is very handsome, juicy, and pleasant, but not rich. De Caradeuc is small, tough, and rather astringent in flavor, but an enormous bearer. Langdon is fine. The colored plate of "Miner," in our report just issued, is an excellent illustration of that variety. It is large and bright in color, thin skin, though the skin is somewhat astringent. Wild Goose is more scarlet and brighter than Miner, and I think nothing is more showy or beautiful than a Wild Goose plum. There are several reasons why plums of the Chickasaw type are desirable. The skin being tough they are not so easily punctured by curculio, and they are less subject to rot than the finer sorts. Consider Miner better than Richland, which, with us, is very subject to rot.

Mr. **SHELLER**. I purchased Miner some years ago, when first introduced, and suppose it was genuine. Has had plenty of blossoms, but does not fruit well, most of the fruit falling off. Had a few specimens the past season but they were too small to be of any value for market.

Mr. **SATTERTHWAIT**. Many years ago in traveling through the west I saw entire forests of wild plums. The trees were loaded with fruit, all of which were seedlings, and no two alike. If brought under cultivation, about one in twenty might be as good as our cultivated plums. If years ago some of the finest varieties had been taken and improved by cultivation, we would now have valuable acquisitions.

Mr. **LONGSDORF**. Saw these wild plums grow in the west near Omaha, in 1857 and 1858; saw very fine specimens, some yellow, some beautifully mottled, and of good size and fair quality. By crossing them with our fine sorts, some valuable new varieties could no doubt be produced.

Mr. **MEEHAN**. I do not think these American plums are any hardier than other varieties, and that they are curculio proof is also claiming too much. Have seen them grow in great abundance in the south, but they do not ripen more fruit than other finer varieties. As to the Miner and De Caradeuc, I think it is not claimed that they are seedlings of the Chickasaw type, but rather of the old cherry plum.

Mr. **SATTERTHWAIT**. Mr. Meehan's experience differs from mine. Mr. Hoopes and others who have tested them, say they are much less liable to attacks from curculio than others.

Mr. **WILLIAMS**. Of my Wild Goose plums, three fourths drop off before they attain full size. The variety I have is oblong and very beautiful.

The **PRESIDENT**. All the plums of this kind I ever saw were round. Never saw an oblong specimen.

Mr. **THOMAS**. One good quality of the Wild Goose plum has not been mentioned, and that is its keeping quality. Can be picked two or three days before shipping.

Marengo and Tetofsky apples, Waterloo peach, and Champion quince were passed over without discussion, no one present having had any experience with them.

The **PRESIDENT**. Thought some action should be taken on the question of holding an evening session. An address on temperance and prohibiton will be delivered in this building this evening by the Governor of Kansas, and some may wish to hear him.

Mr. **ENGLE**. It would perhaps be well to take a vote on the question and abide by the will of the majority.

Mr. **HOOPES**. I came to attend the annual meeting of the State Horticultural Association, and my first duty is to this Society. I think we had better hold an evening session.

Mr. **CALDER**. Would like also to hear both Governor St. John and Fred. Douglass, but prefer to see this meeting through.

The Society voted to take a recess to seven and one half o'clock, P. M.

EVENING SESSION.

The President reminded the Association that there were still three questions on the printed list that had not been discussed, and suggested that they be first disposed of.

The following was then taken up:

Are low branched trees preferable to those trained high?

Mr. **SATTERTHWAIT**. I usually let trees branch as low as they will, and then remove all branches that interfere with plowing and thorough cultivation. I cultivate only one way, and close up to the trees. On the row, trees are allowed to interlace and branches are often tied together with string to support each other.

Mr. **ENGLE**. Consider low-branched preferable on the ground of convenience. We can have as much top on a low as on a high tree. Fruit is more easily picked, does not fall so far, and bruises less.

Dr. **RYDER**. The question is, what constitutes a low tree. Three feet is low, because in a few years we cannot get within ten feet of the stem. In Delaware, growers are heading trees high instead of low. They claim that low headed trees are more liable to grow up and split. Then when the fruit is off they can be cultivated up closely.

Mr. **SWIFT**. I prefer trees headed as low as possible. There is no advantage in having the trunks exposed to the rays of the sun.

Mr. **BARTRAM**. There is so much difference in the growth of different varieties that we cannot always tell what kinds to head down. Some are upright in habit, while such sorts as Smoke-house and Greening come down naturally.

The **PRESIDENT**. I am satisfied that low training is preferable. In the west they are obliged to train trees low, and they bear immense crops.

SECOND QUESTION—IS PEAR CULTURE AS PROFITABLE AS APPLE CULTURE?

Mr. **HOOPES**. This is a question of soil and location altogether. With us the pear is not as profitable as the apple. With Mr. Satterthwait it is. There is not enough clay in our soil for the pear.

Mr. **SATTERTHWAIT**. This question depends upon circumstances, though

I think either can be made pay. Where a man has the right kind of soil, plenty of manure, and the right location, I think the pear more profitable than the apple. It is one of my most certain fruits, and I seldom, if ever, miss a crop. I think there is no place in the world so well adapted to pear culture as Pennsylvania. I think the introduction of "Kieffer's Hybrid" will stop the bringing of pears from California, Boston, and Rochester to our markets here.

Dr. **RYDER.** I don't wish to discourage Pennsylvania pear growers, but Mr. Franklin Davis has a plantation of sixteen thousand Bartlett pear trees on the James river. He has never made peach growing pay. His sales of pears last season were estimated at $40,000. He picks early, puts in bushel boxes, and ships to New York. His trees were planted since the war and are doing well. Pears are also being planted along the Sassafras river in Delaware and Maryland.

Mr. **ENGLE.** I think we must conclude from the evidence that the pear is the most profitable.

Mr. **LONGSDORF.** We can hardly draw a proper comparison between apples and pears. . Imagine, if you please, that as many pears were grown as apples, would they pay as well? Pears cannot come into such general use as apples, and unless they are very fine, they are extremely low in price.

Mr. **MEEHAN.** The chief demand for pears is for table use, and we cannot use them in as many ways as we use apples. Those who deal direct with consumers can make pears profitable, but those who ship and sell through commission men find the market frequently overstocked, and must sell low to dispose of them. I think if largely planted there would be but little profit in pears.

Mr. **SHERFY.** I am satisfied they can be made profitable if the right course is pursued in selecting varieties and marketing properly.

Mr. **WOODS.** If we make a proper selection of varieties, and ripen them carefully, we can have pears five months out of the twelve—July to December.

Mr. **HOOPES.** After hearing this discussion we must conclude that it is merely a question of location and soil. Our soil and location are not adapted to pears, and we don't succeed well with them.

Mr. **SATTERTHWAIT.** In reply to one of the questions in the query box: "What are the really good late winter pears?" I might say that I have nothing later than Lawrence that can be recommended. Josephine de Malines is of no account whatever. Rutter is an October variety, but one of our most valuable varieties. Winter Nelis is no value at all with me. I have nearly one thousand trees of Lawrence. It is not a late-keeping variety, but in a fruit-house could no doubt be kept all winter. Beurre Easter is one of the worst of five hundred varieties, and never comes to perfection. Dana's Honey is perhaps the best of winter pears, but it is small and not later than Lawrence. The demand for winter pears is somewhat limited.

Mr. **STRODE.** After the middle of November pears do not bring as good prices as earlier. Only a limited quantity can be sold.

The **PRESIDENT.** At the last meeting of the American Pomological Society I saw one hundred and sixty-one varieties of pears exhibited by Mr. Wilder, and was surprised to see so few winter varieties.

BARBED WIRE VERSUS LIVE HEDGES.

The third printed question was next taken up.

Mr. **Strode.** I have a horse that shows the advantage of barbed wire by going on three feet. Three strands will turn cows, but have seen six strands that would not turn sheep nor pigs. Dr. Morris, of our county, has abandoned the use of barbed wire.

Mr. **Longsdorf.** I find it is being condemned in some localities on account of injury to animals.

Mr. **Bartram.** I have put up one hundred pounds barbed wire, but will put up no more. Will put up plain wire, it being more satisfactory.

The **President.** Tons of barbed wire have been used along the New Jersey railroads, and found to be cheap and satisfactory. Some of the land owners, however, object because horses are injured. It costs about half what good post and rail fence will cost. Live hedges along railroads are not satisfactory because fires destroy them, and are being abandoned in the west for barbed wire. For the farm, where posts and rails are not too high, they are still the cheapest and most substantial fence.

Mr. **Woods.** The first cost of a hedge fence is a trifle, but it must be kept down.

Dr. **Ryder.** The finest and most substantial hedges I have ever seen are in Maryland, on the Peninsula. They are planted and left grow two or three years without any trimming. They are then cut partly off and laid down, making a tight, substantial fence. Pruning is done once a year when the wood is soft. Osage orange is used altogether.

Mr. **Engle.** Have used hedges twenty years or more, and they have kept in good condition. Have rooted some out because injurious to adjoining crops, and put in barbed wire. Have had no accident with wire thus far. I think hedges should be pruned three times a year when the wood is soft. It can be done with a common scythe very rapidly.

Mr. **Meehan.** I had about concluded myself that barbed wire will supersede hedges, but when in the west lately one of the officers of a long line of railway told me that they had about concluded to take up their wire fences and resort to good hedges only. The wire will slacken, get unsightly and unfit for the purpose for which it was put up. He said also that persons pry out the staples, and, in short, he said they "would not do." In regard to osage orange there is often more money spent on it than necessary. Have seen them planted four inches apart left grow three or four years and then cut down. It is astonishing what a strong hedge they will make by that method. Some object also to the roots of osage as being injurious, but that is the case only when hedges are allowed to grow larger than necessary for a hedge. I very much doubt whether the time has yet come when barbed wire will supersede live hedges.

Mr. **Sattherthwat.** In our three leading fruit crops there is only one great difficulty in the way of growing each. We should try and find out the causes and remedies for these great obstacles, and to that end I offer the following, which were adopted:

Resolved, That a committee of three be appointed by the Chair to inquire into, and report to the next meeting of the Society, all the facts and information obtainable, concerning the peach yellows, having reference, particularly, to the manner in which the disease is communicated from tree to tree, and other facts concerning it, which may be useful in aiding to exterminate the disease;

Also, a similar committee concerning the fire-blight in the pear;

Also, a similar committee concerning the codling-moth, giving the natural history and habits of the insect, the different appliances that have been invented for entrapping it, and make such other suggestions as may occur to them, that may lead more effectually to its destruction.

The following committees were appointed:

On the First Resolution—Raphael Sherfy, chairman, Gettysburg; Casper Hiller, E. H. Cocklin.

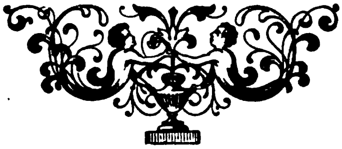
On the Second—E. Satterthwait, chairman, Jenkintown; H. A. Chase, J. G. Engle.

On the Third—John I. Carter, chairman, Chatham; S. S. Rathvon, H. A. Longsdorf.

Mr. Calder moved that after adjournment such fruits as were left upon the tables be donated to the Secretary of the State Board of Agriculture, for himself and other officers in the building.

The motion was unanimously adopted.

Whereupon the Society adjourned.



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PENNSYLVANIA STATE COLLEGE.

LEGISLATIVE DOCUMENT, No. 4.

ANNUAL REPORT

OF THE

PENNSYLVANIA STATE COLLEGE.

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PENNSYLVANIA STATE COLLEGE.

Opened to students, February 16, 1859, as the Farmer's High School, and limited in its purposes, at that time, to theoretical and practical agriculture, this institution has since been enlarged in its scope in order to comply fully with the act of Congress of July 2, 1862, which prescribed as its object "the liberal and practical education of the industrial classes in the several pursuits and professions in life." Its courses of study have, consequently, been greatly extended, and now include subjects foreign to the original plan; and yet, though no longer exclusively agricultural, it presents a more extended and complete course of instruction in that special pursuit than ever before.

Among the gains in this direction, may be mentioned the establishment of a course of training in mechanic arts; the fitting up of a special laboratory for quantitative analysis with reference to agricultural work; the organization of a short SPECIAL COURSE in agriculture, for those whose time or means will not permit them to take the longer course; and the beginning of a series of bulletins for distribution among farmers. In a subsequent part of this report there are presented some results of investigations conducted by this department during the past year. This is, with modifications and additions, the same as the bulletins issued in November and December last, and may serve, in part, as a specimen of the work intended to be done by these bulletins. Other investigations and experiments are now in progress, the results of which will be published hereafter.

The College invites the fullest inquiry on the part of farmers, by personal visits to the College, through committees of those in whom they have confidence, and in every way that will acquaint them with the instruction imparted on matters pertaining to their calling. The College further invites correspondence concerning new weeds, new insects, and similar topics of interest to agriculturists.

While the attendance is still far below the capacity of the College, it is nevertheless gratifying to be able to announce that the higher instruction is more valued year by year, as is evidenced by the fact that former graduates are returning to pursue graduate studies in the College, and that those who enter on a college course are more desirous than formerly to complete it.

The following is the summary of attendance, as given in the last catalogue, 1882-83:

Resident graduates,	5
Graduates at last commencement,	3
Seniors,	10
Juniors,	9
Sophomores,	10
Freshmen,	18
Special students,	8
Preparatory, second year,	30
Preparatory, first year,	55
Total,	148

MODIFICATIONS OF THE COURSES OF STUDY.—The Board of Trustees last year made several important changes in the work of instruction, with a view to rendering that work more economical and more efficient.

PREPARATORY DEPARTMENT.—As some of the subjects formerly taught are taught in all public schools, and may, therefore, be fairly required of every applicant, and as a fuller preparation is needed by those who would enter the College, the standard for admission to this department was somewhat raised.

COLLEGE COURSES.—This change prepared the way for a corresponding advance in the requirements for admission to the freshman class, which went into effect at the opening of the present college year, August, 1882.

Another, and in some respects greater change was made by postponing the purely technical instruction to the last two years of college study. The object in this change was twofold—to diminish the expense of instruction by teaching as one class, all those pursuing the same study, and to give the professional student the needful acquaintance with the sciences underlying his special work, before attempting to explain the processes depending on those sciences. For example, when agriculture, which involves the application of the sciences to a greater extent than any other employment, was studied in the freshman year, it was necessary for the professor in charge to discuss at length certain questions, which would be fully explained subsequently, as part of the regular instruction given by the professors of chemistry, botany, &c. As a consequence either the professor gave but a partial explanation, and the pupils but half understood the principles involved, or there was a great waste of time of both professors and pupils. By the present arrangement, the student who takes a technical course, is prepared to understand the principles and processes as they are presented for his study. A further advantage comes from the fact, that those who already have the scientific knowledge required can take up, and complete in a comparatively short time, the technical course desired.

NEW DEPARTMENTS.—Systematic instruction in the mechanic arts was introduced during the last year, the course in the spring session being one in wood-working. The training is on what is known as the Russian system, which aims at *instruction*, not *construction*. Each student is furnished with necessary material, and with a full outfit of tools—planes, saws, chisels, gouges, bits, square, &c.,—and is taught how to sharpen his tools and keep them in order, and how to use them, to plane, saw, make correct angles, joint, frame, &c., &c. A room has been fitted up for mechanical drawing, and the course in drawing extended, in order that students may be fitted to produce not merely rough sketches but, if need be, working-drawings of machinery required for their business; and it is the intention of the Board of Trustees to extend this course as rapidly as their means will allow.

The new arrangement of courses and other changes in the conditions attached to the work of the professor of agriculture, have secured to him a great increase in the amount of time which he can give to the proper work of his department, and promise both increased efficiency in teaching, and through the new laboratory, valuable results in the line of original investigation.

The chair of political and social science has been filled, and a professor of geology and zoology elected since the last annual meeting of the Board. The instruction in these departments is now regularly carried forward.

NEW COURSES.—In connection with the modification of existing courses, the College has established three new courses, namely, Natural History, Chemistry and Physics, and Civil Engineering, besides short SPECIAL COURSES in Agriculture and Chemistry. These courses are intended to fit their graduates to be investigators and workers in those lines in which, for the most part, agricultural advancement must come, and all increase in the equipment of these departments will, at the same time, add to the facilities now offered to the agricultural student.

As stated previously, the earlier studies of the two general courses have been so arranged as to give, during the first two years, preparation for the various technical courses. These new courses, therefore, and Agriculture, being technical, have bnt two years of their special work, but they require for graduation a previons knowledge of the studies of the freshman and sophomore years, of one or other of the general courses.

The schedules of all the courses are presented in full in the College catalogue, which can be obtained on application.

Practicums.

In all industrial colleges which deserve the name, practice is associated with theory, and students are taught not only what to do and why, but how to do it. Probably no institution has yet settled to its own satisfaction what studies must be recognized as, in this sense, practical, and what proportion of time should be allowed for practice in each. One point, however, may be taken as established, namely, that a student's time should not be spent on manual labor which does not bring needed skill, and which, therefore, is to him mere drudgery. In the arrangement of the existing schedules of studies, the fact has been constantly borne in mind that the student must *do* as well as *study*, and so each session has its practicum, while, on the other hand, care has been taken that no subject shall have more practice than it deserves. It will be understood, therefore, that even where practicums are not announced in the schedules, the student receives one to two hours daily of practice appropriate to his studies.

A slight examination of the courses will show that a student gains a working knowledge of many important matters, such as book-keeping, drawing, mechanic arts, horticulture, and surveying, before he is prepared to enter a technical course; and in the last two years of college life, he is expected to add largely to his practical knowledge.

In all his practice, from first to last, the student is constantly under the supervision of an instructor who is familiar with the details of the operations and with the reasons for them. Still further, although members of the same class work together, the instruction is so largely personal, that an earnest student may, without running in on the time allotted for study and recreation, advance far beyond the average attainments of his companions. Sometimes, too, a student does not grasp a certain subject firmly until he has approached it from the practice side, but then develops such an aptitude for it, as rightly causes him to choose it for his life-work. The experience of the college adds, from year to year, to the evidence that this training is highly valuable, and in directions which no one can foresee, even when the pupil does not, at the time, appreciate its full importance.

Farmers' Institute.

A course of about forty lectures by professors of the College or other experts in the topics to be considered, has been arranged for mid-winter.

The subjects for discussion are as follows: Agricultural Chemistry, Botany, Dairying, Entomology, Farm Accounts, Feeding, Fertilizers, Fruit Growing, Grain and Forage Crops, Mechanics, Roads and Bridges, Stock Breeding, Vegetable Gardening, Politcal Economy for Farmers, Industrial Education, Drinkable Waters, and Adulteration of Foods.

The course will open on Tuesday morning, January 30, 1883, and close on Friday, February 9.

The instruction will be absolutely free to all, there being no fee, entrance examination, or other condition of admission.

A portion, at least, of those in attendence, can secure rooms in the College at a net charge of three dollars per room. The rooms are heated by steam, and have such furniture as is supplied to students, viz: Bedstead, mattress, wash-stand, table, and chairs; other articles, such as lights, bedding, towels, &c., must be supplied by the occupants. Table boarding costs three dollars per week in the village boarding-houses; two dollars in the college boarding club.

Farmers and those who intend to be farmers, are cordially invited to come and share in the exercises.

Free Scholarships.

There have recently been established fifty free scholarships, one for each Senatorial district in the State. The scholar, male or female, is to be appointed by the Senator of the district, after a competitive examination in the studies required for admission to the freshman class. No person is eligible as a candidate who has previously been admitted to any class in the college.

The holder of the scholarship is admitted to the privileges of the institution free of the ordinary charges for incidentals, room-rent, fuel, and furniture; this immunity to continue for the entire college course, provided that both conduct and class-standing be satisfactory to the faculty. A vacancy may be filled after the opening of the college year, if the appointee's attainments do not fall below the standard of the class at the time of application for admission. For information, as to vacancies, time, and place of examination, &c., candidates for a scholarship should apply to their Senator, in whose hands the details of appointment have been placed by the College.

College Courses.

FALL SESSION.—	Incidentals,	$6 00
	Room rent, fuel, and furniture,	9 00
WINTER SESSION.—	Incidentals,	4 00
	Room rent, fuel, and furniture,	11 00
SPRING SESSION.—	Incidentals,	4 00
	Room rent, fuel, and furniture,	6 00

There is no charge for tuition in any course.

The charge for incidentals is intended to cover the expense of heating, lighting, and caring for the corridors and the recitation and other public rooms. This is the only charge made to pupils who do not room in the College.

The above charge for room-rent, fuel, and furniture is made to those who room in the building, and is on the basis of two persons to each room. In cases where a student rooms alone, he will be charged four dollars additional per session.

Students must settle their college bills in advance, unless excused by the Executive Committee of the Board.

Calendar for 1882-83.

Fall session, 16 weeks, opened, ...	Friday, August 25, 1882.
Falls session closes, ...	Friday, December 15, 1882.
Winter session, 12 weeks, opens, ...	Friday, January 5, 1883.
Farmer's Institute, ...	January 30–February 9, 1883.
Winter session closes, ...	Friday, March 30, 1883.
Spring session, 12 weeks, opens, ...	Friday, April 6, 1883.
Commencement, ...	Thursday, June 28, 1883.

The following account of one line of experiments conducted by Prof. W. H. Jordan on the College and Eastern Experimental farms during the years 1881–2, is printed for the information of farmers and others interested in agricultural science. It is believed that practical information distributed in this form will be of important service to the agricultural interests of the State. The matter is substantially the same as was contained in Bulletins Nos. 1 and 2, issued by the College in November and December last.

Correspondence is invited.

The Results of Experiments showing the Effects of various Fertilizers on the Growth of Wheat, Corn, and Oats.

The main consideration that leads farmers to adopt or reject any system of crop production, is that of profit. In particular, is the question of the economy of using commercial manures, lime, plaster, &c., carefully scrutinized. The decision as to what fertilizer or other substance is to be applied to the land, should be based on two points:

First. The effect on the quantity and quality of the crop.

Second. The effect on the future fertility of the soil.

It is safe to say that the former point is often kept in mind, while the latter is utterly neglected. To obtain a crop for the present season, seems with many farmers to be the chief aim, regardless of what future years are to bring.

The system of field experiments now in progress on two of the experimental farms of the college. is intended to include the use of all the principal methods that are generally employed for the maintenance of fertility, and is to be continued for a number of years sufficient to determine the ultimate effect and value of the different methods of manuring employed. There is involved in these experiments a four years' rotation, corn, oats, wheat, grass, to be carried out on four parallel series of plots, each plot in a series to be treated the same way, year after year, and in the same manner that a corresponding plot in each of the other series is treated. It is hoped that we may thus obtain some facts of general interest with regard to the use of commercial and farm manures, of lime, with and without yard manure, of plaster, &c.

In order to make intelligible the methods and aims of the experiments, a little explanation of the chemistry of fertilizers may be necessary.

Commercial fertilizers contain, among various ingredients, three that are especially valuable, and upon which the market prices of the fertilizers are based, viz: *Nitrogen*, *phosphoric acid*, and *potash*. Some fertilizers contain one of these ingredients, some two, and some all.

Dissolved bone, ***dissolved bone-black***, and ***dissolved South Carolina rock*** contain only ***phosphoric acid***, excepting a small percentage of nitrogen in the dissolved bone. The chief source of *potash* is the *muriate* and *sulphate of potash* that are imported to this country from Germany, these salts containing no other valuable ingredient. *Wood ashes* also contain a great deal of potash, but are available only in certain sections of the country. *Nitrogen* is sold principally in *nitrate of soda*, (Chili saltpeter,) *sulphate of ammonia*, *dried blood*, *dried fish*, and various kinds of *meat scrap*, none of these substances containing anything of much value save the nitrogen.

The *superphosphates* that are found in the market contain phosphoric acid as the principal ingredient, accompanied, usually, by small percentages of nitrogen and potash. In compounding these superphosphates, manufacturers take some form of bone or South Carolina rock as the basis, adding a little nitrogen and potash, by using some of the materials mentioned above.

Of these three ingredients nitrogen is the most costly, the price ranging from 18 cents to 26 cents per pound, according to its source. Soluble phosphoric acid costs about 12½ cents per pound, while the insoluble form is sold at prices varying from 3 cents to six cents. Potash is worth 4½ cents in the muriate, and 6 cents in the sulphate.

All the elements of plant growth are found in yard manure, the percentages of nitrogen, phosphoric acid, and potash present depending upon the food from which the manure is made. Yard manure also contains a large amount of organic material that commercial manures do not, to which, however, we can assign no definite value.

1. Experiment on Wheat.

The experiment here reported was conducted upon the Central Experimental farm of the College, on land that is a limestone clay, and on plots that produced a crop of oats the preceding season, which was manured in exactly the same manner as the wheat, in this experiment.

The fertilizers were applied just before the wheat was sown, the yard manure being plowed under, and the commercial manures being harrowed in after the land had been plowed and harrowed once. Dissolved bone-black and muriate of potash were used as the respective sources of phosphoric acid and potash, and nitrogen was used in three different forms, viz: Dried blood, nitrate of soda, and sulphate of ammonia. The yard manure was produced from wheat-bran, corn-meal, corn-stalks, and hay, fed to milch cows and fattening steers, wheat straw being freely used as a litter. In all respects, except in the application of different fertilizers, the various plots were treated exactly alike. They are two hundred and sixty feet long, by twenty-one feet wide, each containing one eighth of an acre.

The following tabulation of results should be examined with certain questions in mind.

1. What ingredient or mixture of ingredients was most efficient?
2. What was the effect of a large application of nitrogenous material?
3. How do the results from commercial and farm-yard manures compare?
4. Did lime, ground limestone, or plaster increase production?
5. Did any of the fertilizers affect the quality of the wheat?

	Number of plot.	KIND OF FERTILIZER.	Quantity of fertilizer.	Cost of fertilizer.	Quantities of valuable ingredients.			Yield per acre.		Weight of a measured bushel at time of threshing.
					Nitrogen.	Phosphoric acid.	Potash.	Wheat.	Straw.	
			lbs.		*lbs*	*lbs*	*lbs.*	*bush*	*lbs.*	*lbs.*
	1	Nothing,	. .	.		.	.	7	420	52¼
Valuable ingredients singly.	2	Dried blood,	320	$7 20	32		.	11.1	1,576	56
	3	Dissolved bone black,	300	5 25	.	48		20.3	1.904	60
	4	Muriate of potash,	200	4 50		. .	100	13.3	1,400	59¼
Valuable ingredients two by two.	5	Dried blood,	240							
		Dissolved bone black,	300	10 05	32	48	. .	22	1,520	61
	6	Dried blood,	240							
		Muriate of potash,	200	9 90	32	.	100	7	984	54
	7	Dissolved bone black,	300							
		Muriate of potash,	200	9 75	. .	48	100	19.3	1,840	61½
	8	Nothing,	.				. .	16.6	1,720	61½
Complete fertilizer† with nitrogen in different proportions. Nitrogen furnished by dried blood	9	No. 7,*	500							
		Dried blood,	240	15 15	24	48	100	21.6	2,464	61½
	10	No. 7,	500							
		Dried blood,	480	20 55	48	48	100	21.2	2,624	60½
	11	No. 7,	500							
		Dried blood,	720	25 95	72	48	100	25.3	2,880	60½
	12	No. 7,	500							
		Dried blood,	240	15 15	24	48	100	19.2	2,128	62
	13	Plaster,	320	1 00			. . .	11.7	1,176	55¼
	14	Nothing,						12.4	1 776	59
Commercial fertilizers & yard manure compared.	15	No. 7 alone,	500	9 75		48	100	23 2	2.368	62
	16	Yard manure,	12,000	6 00	41	20	48	23.2	2,664	61
	17	No. 7,	500							
		Dried blood,	240	15 15	24	48	100	24	3,000	61
	18	Yard manure,	16,000	8 00	54	26	64	22.7	2,800	58
	19	No. 7,	500							
		Dried blood,	480	20 55	48	48	100	25.9	2.968	60
	20	Yard manure,	20,000	10 00	68	32	80	23.3	3,080	58
	21	No. 7,	500							
		Dried blood,	720	25 95	72	48	100	22.1	2,432	62
	22	Yard manure,	12,000							
		Lime,	4.000	16 00	41	20	48	21.4	2,816	60
	23	Lime,	4,000	10 00			. .	17 2	2,032	58¼
	24	Nothing,	. . . .	. .		. .	. .	14	2,064	56
Complete fertilizers with nitrogen in different proportions. Nitrogen furnished by nitrate of soda.	25	No. 7 alone,	500	9 75			.	23.8	2,736	62¼
	26	No. 7,	500							
		Nitrate of soda,	160	16 05	24	48	100	27	3,064	60½
	27	No. 7,	500							
		Nitrate of soda,	320	22 35	48	48	100	23.6	2,824	60
	28	No. 7,	500							
		Nitrate of soda,	480	28 65	72	48	100	25.2	3,048	59
Complete fertilizer with nitrogen in different proportions. Nitrogen furnished by sulphate of ammonia.	29	No. 7 alone,	500	9 75	. .	48	100	22.8	2,392	61
	30	No. 7,	500							
		Sulphate of ammonia,	120	15 75	24	48	100	25.1	3,016	61
	31	No. 7,	500							
		Sulphate of ammonia,	240	21 75	48	48	100	26.1	2,912	61½
	32	No. 7,	500							
		Sulphate of ammonia,	360	27 75	72	48	100	24 3	2,504	60
	33	Plaster,	320	1 00	. .	. .	. . .	9.1	1,496	54
	34	Ground limestone,	4,000	10 00	. .	. .	. . .	10.1	1,760	54¼
	35	No. 7,	. . . .	. .	. .	. .	. . .	26.3	2 864	59½
	36	Nothing,	. . . .	. . .		. .	. . .	15.3	2,040	58

* "No. 7" means a mixture similar to that applied to plot 7, viz: 300 pounds dissolved bone black and 200 pounds muriate of potash. In plots 9 to 12, for instance, this mixture is used together with certain quantities of dried blood.

†A fertilizer containing nitrogen, phosphoric acid, and potash.

As several sets of plots in this experiment were treated practically in the same manner, averages of the yield from the plots receiving no fertilizer, and from the plots manured alike, are given in the next table. In this way errors resulting from natural differences of soil are largely eliminated. The former table shows that wherever phosphoric acid and potash are applied, 300 pounds of dissolved bone-black and 200 pounds of muriate of potash were used, furnishing 48 pounds of phosphoric acid and 100 pounds of potash. Nitrogen is the only ingredient that was applied in varying quantities:

	YIELD PER ACRE.		INCREASE OF YIELD OVER PLOTS NOT MANURED.		
	Wheat—bushels.	Straw—pounds.	Wheat—bushels.	Straw—pounds.	Weight of a measured bushel.
Average yield of four plots receiving no fertilizer,	12.2	1,575	....	....	56.4
Yield of one plot receiving nitrogen,	11.1	1,576	. .	. .	56
Yield of one plot receiving phosphoric acid,	20.3	1,904	8.1	329	60
Yield of one plot receiving potash,	13.3	1,400	1.1	....	59.5
Yield of one plot receiving nitrogen and phosphoric acid,	22.0	1,520	9.8	...	61
Yield of one plot receiving nitrogen and potash,	7.0	984	....	....	54
Average yield of four plots receiving phosphoric acid and potash,	22.3	2,336	10.1	761	61.8
Average yield of four plots receiving phosphoric acid, potash, and 24 lbs. of nitrogen,	24.4	2,888	12.2	1,313	61
Average yield of four plots receiving phosphoric acid, potash, and 48 lbs. of nitrogen,	24.2	2,832	12.0	1,257	60.5
Average yield of four plots receiving phosphoric acid, potash, and 72 lbs. of nitrogen,	24.3	2,716	12.1	1,241	60.4
Average yield of four plots receiving yard manure,	22.6	2,840	10.4	1,265	59.3
Average yield of two plots receiving plaster,	10.4	1,336	. . .	. . .	54.8
Yield of one plot receiving ground limestone,	10.1	1,760	. . .	185	54.5
Yield of one plot receiving caustic lime,	17.2	2,032	5	457	58.5

A careful examination of the above tables makes evident the following facts in regard to this year's wheat crop:

1. Phosphoric acid (from dissolved bone-black) was more efficient in increasing the crop than any other ingredient of the fertilizers used.

2. The addition of potash, and especially of both potash and nitrogen, to the phosphoric acid, gave a larger yield of both grain and straw, particularly of straw.

3. The use of the largest quantity of nitrogen (72 lbs.) with the mineral fertilizers, (phosphoric acid and potash—"No. 7," in the first table,) resulted in no larger yield than the use of the smallest quantity (24 lbs.) of nitrogen. That is, increasing the nitrogenous fertilizer did not increase the crop.

4. The increase of crop from the use of yard manure was not so large as from the use of the complete commercial fertilizer.

5. Lime, ground limestone, and plaster had no appreciable effect on the crop.

6. The weight of a measured bushel of wheat was considerably larger, wherever yard manure, or commercial fertilizers containing phosphoric acid, was used. On those plots receiving no manure, or only plaster, ground limestone, or caustic lime, the grain seemed shriveled, and was of less than standard weight.

7. In order to determine the effect of the different methods of manuring upon the composition of the grain, an analysis was made of samples taken from plots that were manured according to the various methods shown. Below are the results:

METHOD OF MANURING.	Water.	100 PARTS OF WATER-FREE SUBSTANCE CONTAINED—				
		Ash.	Albuminoids= N×6.	Crude fiber.	Other carbohydrates.	Fats.
No fertilizer, (average of 4 plots,) . .	13.33	2.35	12.53	3.19	79.63	2.30
Phosphoric acid and potash, (average of 4 plots,)	13.04	2.29	12.07	3.05	80.32	2.27
Phos. acid, potash, and 24 lbs. nitrogen, (average of 4 plots,)	13.16	2.34	12.85	2.89	79.73	2.19
Phos. acid, potash, and 48 lbs. nitrogen, (average of 4 plots.)	13.06	2.27	13.45	2.84	79.25	2.19
Phos. acid, potash, and 72 lbs. nitrogen, (average of 4 plots.)	12.59	2.09	13.38	2.89	79.44	2.20
Yard manure, (average of 4 plots,) . . .	12.41	2.39	12.60	2.70	80.15	2.16

A small increase in the percentage of the nitrogenous portion of the grain, seems to have resulted from the use of nitrogenous fertilizers, which is in accordance with facts previously known. The milling value of the wheat from the well-manured plots is undoubtedly greater than where no fertilizer was applied.

8. No attempt has been made to determine the profit or loss involved in the use of the various fertilizers, as this cannot be done until one rotation has passed, and perhaps several. If simply this year's crop be considered, the plots receiving phosphoric acid alone, and phosphoric acid and potash combined, were the only ones were the increase of crop paid for the fertilizer. The prospects now are, that the yield of grass next year will change the figures somewhat. These results, as well as those obtained in other parts of the country, make it seem doubtful whether the use of large quantities of nitrogenous fertilizers will, at present, be attended with profit. If, however, we adopt the policy of applying manure containing little nitrogen, the time will undoubtedly come when nitrogenous fertilizers will be more essential. The nitric acid and ammonia compounds coming from the air and from the decomposition of organic material in the soil, seem just now to be able to furnish us with a considerable portion of the nitrogen needed for plant growth. The length of time that this will continue to be the case can be determined only by experiment, and would probably vary largely with different soils.

Until we have more data from which to draw conclusions, probably the safest thing for the farmer to do, who wishes to use commercial manures in growing wheat, and has made no study of the needs of his soil, is to apply a fertilizer containing phosphoric acid as the principal ingredient, accompanied by small percentages of nitrogen and potash. The superphosphates in the market answer the purpose very well, the chief objection to them being the small percentage of soluble phosphoric acid which they generally carry.

Does the solid matter of the wheat kernel increase after cutting, when the grain is cut before ripening?

The above question is one somewhat discussed by farmers. Some hold that when wheat is cut while still green, the growth of the kernel is completed after cutting, in the same manner as when the wheat is allowed to stand until fully ripe. In order to get information on this point, samples of wheat were cut at various stages of growth, in each case the kernels of a portion of the sample being removed immediately upon cutting, and the kernels of the remaining portion being allowed to dry on the stalk in the usual manner. After the wheat had become as dry as it would get in a warm dry room, two lots, of five hundred kernels each, were counted from each sample, and then weighed. In this manner any appreciable growth on the part of the wheat dried on the stalk would be detected.

	FIRST LOT.				SECOND LOT.			
	Weight of 500 kernels.		Aver. weight of one kernel.		Weight of 500 kernels.		Aver. weight of one kernel.	
	Taken from stalk at cutting.	Dried on stalk.	Taken from stalk at cutting.	Dried on stalk.	Taken from stalk at cutting.	Dried on stalk.	Taken from stalk at cutting.	Dried on stalk.
	grams	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*
Cut June 24—in milk; kernel only partially developed; shriveled in drying,	4.099	5.281	.00820	.01052	4.137	5.302	.00827	.01060
Cut July 5—upper leaves green; lower leaves dead; head slightly turned; grain shriveled some in drying, . .	14.002	14.202	.02800	.02850	14.151	14 459	.02830	.02892
Cut July 10—stalk nearly all yellow; head tinted green; kernels beginning to turn brown,	16.834	16.697	.03367	.03339	17.222	16.945	.03444	.03389
Cut July 12—heads yellow; kernels colored brown, ...	17 270	17.259	.03454	.03452	17.204	17 249	.03441	.03450
Cut July 15—wheat crop cut same day, . . .	18.491	18.171	.03698	.03334	18.279	18.099	.03656	.03616

The increase in weight of the kernels after the wheat was cut appears to have been about 28 per cent., in the case of the partially developed kernels taken June 24. In all the subsequent samples the kernels dried on the stalk seem to be no heavier than those removed before drying, and immediately after cutting.

1. THE EXPERIMENTS ON CORN AND OATS were conducted on the Central and Eastern experimental farms of the College, in each case occupying one of four series of plots on which are being conducted a system of experiments on corn, oats, wheat, and grass, in rotation. (See Experiment on Wheat.) The results of these experiments are, to a certain extent, negative in their character, which, however constitutes no reason why they should be withheld, for honest experimenting demands that no facts or conditions shall be ignored. In the present case, while we cannot point to any remarkable or even satisfactory increase of crop from the use of any fertilizer, yet the results may serve to give some hints that will prove of value in farm practice. It is not claimed that complete rules of practice for general use can be derived from experimental work on two farms, or on twenty. The most that can be hoped for is the demonstration of principles that can serve for more or less general application, each farmer adapting them to his own peculiar conditions. However much experiment stations or industrial colleges may do for the farmer, each tiller of the soil must, to a certain extent, experiment for himself and form his own rules of practice, applicable to the special conditions with which he finds himself surrounded.

The Experiments on Corn.

On both of the farms mentioned above, for two years (1881 and 1882) considerable time and labor have been devoted to an experiment on corn, using on each farm, for each year, a different series of plots, the yearly number of plots on the Central farm being thirty-six, and on the Eastern farm twenty-two. The fertilizers used were for both years the same, in order, quantity, and kind, as in the wheat experiment previously described. In every case the fertilizers were applied to the plots in the spring, just previous to planting the seed, and shortly after breaking the sod. In 1881 they were sown broadcast on the land after it had been harrowed, but in 1882 they were spread while the land was lying in furrow or before harrowing, a deeper admixture of the soil and fertilizers being secured by the latter method than by the former. In both years the yard manure was spread on the sod, and plowed under. In planting, care was taken that there should be the same number of hills on each plot, and the same number of seeds in each hill. The rows and hills were such distances apart, that each plot contained at the rate of about 40,000 hills per acre—Eastern farm, 4 ft. × 2.6 ft.; Central farm, 3.5 ft. × 3 ft.—and as three stalks were allowed to grow in each hill, the number of stalks per acre was about 120,000. The endeavor was made to complete on all the plots each operation in planting and cultivation on the same day that it was begun, so that no differences in the time of planting the seeds, &c., should cause differences in production. The corn was cultivated in the usual manner, all the plots being treated alike. The size of the plots on the Central farm is one eighth of an acre, being two hundred and sixty (260) feet long, and twenty-one (21) feet wide. On the Eastern farm they contain one twentieth of an acre, being one rod in width, and eight rods in length.

The results reached on each plot in each experiment are not shown here; only the average production of plots that were treated alike on both farms for both years being given. These averages, together with the methods of manuring, can be seen in the following table:

Kinds and quantities of fertilizers applied per acre in 1881 and 1882, on both farms. [The arrangement of the plots in detail is given on page 8.]	*Quantities of valuable ingredients contained in the fertilizers applied to an acre.*			Number of plots represented in the average yields given.	*Yield per acre.*		*Increase of yield due to the fertilizers*	
	Nitrogen, lbs.	Phosphoric acid, lbs.	Potash, lbs.		Corn, bush.	Stalks, lbs.	Corn, bush.	Stalks, lbs.
No fertilizer, ...		. .		Average yield of 16 plots, ...	34.3	2728		
Dried blood, ... 240 lbs.	24		. .	Average yield of 4 plots, ...	34.5	2792	.2	66
Dissolved bone black, 300 lbs.	. .	48		Average yield of 4 plots, ...	37.0	2853	2.7	127
Muriate of potash, 200 lbs.			100	Average yield of 4 plots, ...	32.6	3093	—1.7	367
Dried blood, 240 lbs. Dissolved bone black, 300 lbs.	24	48		Average yield of 4 plots, ...	40.2	2987	5.9	26
Dried blood, 240 lbs. Muriate of potash, 200 lbs.	24	. .	100	Average yield of 4 plots, ...	35.7	3413	1.4	687
Dissolved bone black, 300 lbs. Muriate of potash, 200 lbs.	. .	48	100	Average yield of 14 plots, ...	37.6	3106	3.3	380
Dissolved bone black, 390 lbs. Muriate of potash, 200 lbs. Nitrogenous fertilizer,[1] —	24	48	100	Average yield of 16 plots, ...	36 3	3298	2.0	572
Dissolved bone black, 300 lbs. Muriate of potash, 200 lbs. Nitrogenous fertilizer,[2] —	48	48	100	Average yield of 14 plots, ...	37.5	3245	3.2	519
Dissolved bone black, 300 lbs. Muriate of potash, 200 lbs. Nitrogenous fertilizer,[3] —	72	48	100	Average yield of 14 plots, ...	36.6	3256	2.3	530
Yard manure,[4] 16,000 lbs.	54	26	64	Average yield of 10 plots, ...	36 9	2700	2.6	— 26
Plaster, ... 320 lbs.	.		. .	Average yield of 6 plots, ...	34.6	2620	.3	—106

RESULTS OF THE EXPERIMENTS ON CORN.—It will doubtless be to many a matter of surprise, that the use of such liberal quantities of fertilizers on corn has failed to produce satisfactory results. In this respect, yard manure has proved to be no exception. For both years, and on both farms the results have been similar. In 1881 they were ascribed to the severe drought that prevailed during the growing season. But as can be seen by the appended records of temperatures and rain falls, the season of 1882 has been, so far as heat and moisture are concerned, fairly favorable for the growth of crops. It was thought that in 1881, the fertilizers might not have been mixed with the soil deep enough to exert the maximum effect, but the deeper admixture in 1882, caused an increase of crop no larger than that of 1881.

It does not seem possible that the ingredients of the fertilizers were not available to the growing plants, or that any needed element of growth was not supplied. The complete commercial fertilizer, in a majority of cases, consisted of dissolved bone black containing over fourteen per cent. of soluble phosphoric acid, muriate of potash containing fifty per cent. of potash in a soluble condition, and sulphate of ammonia or nitrate of soda, containing large quantities of nitrogen in the most available form possible.

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[1] Either *dried blood, sulphate of ammonia*, or *nitrate of soda*, enough being used in any case to furnish 24 lbs. of nitrogen per acre. When dried blood was used, it required 240 lbs.; when sulphate of ammonia, 120 lbs.; and when nitrate of soda, 160 lbs. per acre.

[2] Either 480 lbs. of dried blood, 240 lbs. sulphate of ammonia, or 320 lbs. of nitrate of soda, containing 48 lbs. of nitrogen.

[3] Either 720 lbs. of dried blood, 360 lbs. of sulphate of ammonia, or 480 lbs. of nitrate of soda, containing 72 lbs. of nitrogen.

[4] Composition assumed to be the average of fresh manure.

Besides, the mixture contained sulphuric acid and lime, and small quantities of other ingredients that enter into plants. Certainly the yard manure was able to supply everything that the crop needed for growth, which the soil itself might fail to furnish, for it was made up of decomposed vegetable material, which is the most complete fertilizer possible.

The main and important fact with which we have to deal, is that the corn on the plots receiving no fertilizer, found sufficient material for growth to produce nearly as good a crop as where a large quantity of extra material was furnished in the manures; and consequently that the fertilizers were unprofitable, so far as the corn crop was concerned. One probable explanation of the fact, that the various manures affected the yield so little, is that on both farms the corn was grown upon sod. In other words, a large quantity of roots and stubble decomposed in the soil during the time the corn was growing; furnishing, together with what came from the soil itself and from rain water, sufficient available material to nourish a fair crop.

It should also be remarked, that corn makes its growth during that season of the year when the disintegration of the organic and mineral ingredients of the soil is the most active, and is, therefore, able to seize upon and utilize during a long period of growth, the material thus made available. So it is not strange that land in a hardly fair state of fertility should be able to nourish, without aid, an average crop of corn. And yet, as the yield on the plots receiving no fertilizer was in all cases rather below the average, this explanation hardly accounts for the fact that no form of fertilizer availed to secure more than moderate production. We are accustomed to think that below the limit of very large crops, the greater the supply of available plant food in the soil, the greater the production, unless some especially unfavorable condition prevails. But when on some plots, an amount of available material equal to that of the plots not manured, is supplemented by large additions from outside, and we see no especial increase of production, we are driven to the conclusion that other conditions besides the mere presence of plant food, place limitations upon a crop. The relation to crop production of the physical characteristics of the soil, such as coarseness or fineness, looseness or compactness, and of the degree of heat and moisture at particular seasons of growth, is but little understood. The whole question of the influence of the climate of each season and of each locality upon vegetable life, is one of which we have yet much to learn.

During the two years, sixteen plots receiving no fertilizer produced an average of 34.3 bushels of corn per acre, and on fourteen plots to which were applied a fertilizer containing enough of the principal ingredients of plant food for the growth of fifty bushels of corn per acre, the average yield was 36.6 bushels, a difference of only 2.3 bushels. Granting that the error arising from differences in the plots cannot be entirely eliminated, where the averages of so many plots are taken, this cannot be sufficient to account for the absence of a greater difference of production in the two cases cited. Beyond a statement of the fact, that the corn was grown upon sod, and during the season of the most abundant production of plant food in the soil, we will not attempt here an explation of the failure to receive satisfactory returns from the use of commercial fertilizers and of yard manure.* Certain phases of the whole question will be discussed more in detail in a future bulletin.

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* NOTE.—Since writing the above, there have come to hand some observations on the root development of corn, made by Dr. Sturtevant of the New York Experiment Station, which seem to indicate that this cereal has larger feeding capacity than many other plants, and consequently can make good development where other crops would require aid in order to attaid equal relative growth.

Experiments on Oats.

3. Experiments on oats have been conducted during the past season on both the farms mentioned above. On neither farm were the fertilizers applied directly to the oats, but in each case the crop was grown on plots that had been manured for corn the previous season,† after the plan already given in the account of the wheat experiment. (See Bulletin, No. 1.) As the oats were the second crop removed after a single application of the various fertilizers, it would seem that the results from the different plots might give some indication both of the actual, and of the relative effect of the several methods of manuring on the permanence of fertility.

The oats were cultivated on both farms in the ordinary manner. The plots were plowed in the spring, just previous to sowing the oats, were then harrowed, seed was sown at the rate of two bushels per acre, the land was harrowed again, and then rolled.

(*a*) EXPERIMENT ON THE CENTRAL FARM.—On this farm the land is a limestone clay, of good quality. The plots are one eighth of an acre in size, being of the same dimensions as the wheat plots, viz: two hundred and sixty feet long, by twenty-one feet wide. As before stated, the fertilizers had been applied to the corn crop of the previous season, but none were used on the oats.

The following table shows the kinds and quantities of fertilizers applied to the corn in 1881, and the yield of oats in 1882. On the average yields of plots manured essentially alike are given:

Kinds and quantities of fertilizers applied per acre to corn in 1881, but none to the oats in 1882.	*Quantities of valuable ingredients contained in the fertilizers applied in 1881.*			Number of plots represented in the average yields given.	*Yield per acre in 1882.*		*Increase of yield due to the fertilizers the second season after their application.*	
	Nitrogen.	Pposphoric acid.	Potash.		Oats—bushels.	Straw—pounds.	Oats—bushels.	Straw—pounds.
No fertilizer, ...	. .	. .	. .	Average yield of 5 plots,	39.6	2227		
Dried blood, ... 240 lbs.	24	. .	. .	One plot, ...	45.6	2532	6	305
Dissolved bone black, . . 300 lbs.	. .	48	.	One plot, ...	45.1	2448	5.5	221
Muriate of potash, ... 200 lbs.	. .	. .	100	One plot, ...	46.9	2648	7.3	421
Dried blood, ... 240 lbs. Dissolved bone black, . . . 300 lbs.	24	48	.	One plot, ...	45.9	2416	6.3	189
Dried blood, ... 240 lbs. Muriate of potash, ... 200 lbs.	24	.	100	One plot, ...	41.7	2656	2.1	429
Dissolved bone black, . . . 300 lbs. Muriate of potash, . . 200 lbs.	. .	48	100	Average yield of 4 plots, . . .	43.3	2183	2.7	−34
Dissolved bone black, . . 300 lbs. Muriate of potash, . . . 200 lbs. Nitrogenous fertilizer,* . . —	24	48	100	Average yield of 5 plots, . .	44.4	2520	4.8	293
Dissolved bone black, . . . 300 lbs. Muriate of potash, . 200 lbs. Nitrogenous fertilizer,* —	48	49	100	Average yield of 4 plots, . .	44.5	2530	4.9	278
Dissolved bone black, . 300 lbs. Muriate of potash. . 200 lbs. Nitrogenous fertilizer,* . . —	72	48	100	Average yield of 4 plots, . . .	46.3	2544	6.7	317
Yard manure, ... 16 000 lbs.	54	26	64	Average yield of 4 plots, . . .	48.2	2828	8.6	601
Plaster, ... 320 lbs.			. .	Average yield of 2 plots, . .	39.3	2364	.	137
Ground limestone, ... 4,000 lbs.	. .	. .	. .	One plot, ...	37.1	2528	. .	301
Caustic lime, ... 4,000 lbs.	. .	. .	. .	One plot, ...	45.9	2432	6.3	205

* See explanatory notes of previous table—page 13.

(*b*) EXPERIMENT ON THE EASTERN FARM.—Nearly the same conditions existed on this farm as on the Central farm, viz: The oats were grown on a series of plots that had produced a crop of corn since being manured, no fertilizers being put on the oats; the exceptions being that the plots contain one twentieth of an acre instead of one eighth, and that the soil is of somewhat different character.

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† The series of plots used in the experiment on corn in 1881.

In the next table can be seen the same statement of facts for the Eastern farm that was made in the last preceding table for the Central farm.

Kinds and quantities of fertilizers applied per acre to corn in 1881, but none to the oats in 1882.	*Quantities of valuable ingredients contained in the fertilizers applied in 1881.*			Number of plots represented in the average yields given.	*Yield per acre in 1882.*		*Increase of yield due to the fertilizers the second season after their application.*	
	Nitrogen.	Phosphoric acid.	Potash.		Oats–bushels.	Straw–pounds.	Oats–bushels.	Straw–pounds.
No fertilizer, ...	. .	.		Average yield of 3 plots, ...	22	1100		
Dried blood, ... 240 lbs.	24			One plot, ...	22	980		–120
Dissolved bone black, 300 lbs.		48		One plot, ...	28.6	1220	4.6	120
Muriate of potash, 200 lbs.	.		100	One plot, ...	25.5	1155	3.5	55
Dried blood, 240 lbs. Dissolved bone black, 300 lbs.	24	48	. .	One plot, ...	27.3	1140	5.3	40
Dried blood, 240 lbs. Muriate of potash, 200 lbs.	24	. .	100	One plot, ...	26.6	1160	4.6	60
Dissolved bone black, 300 lbs. Muriate of potash, 200 lbs.	. .	48	100	Average yield of 3 plots, ...	29.1	1340	7.1	240
Dissolved bone black, 300 lbs. Muriate of potash, 200 lbs. Nitrogenous fertilizer, *—	24	48	100	Average yield of 3 plots, ...	28 9	1360	6.9	260
Dissolved bone black, 300 lbs. Muriate of potash, 200 lbs. Nitrogenous fertilizer, *—	48	48	100	Average yield of 3 plots, ...	29.5	1622	7.5	522
Dissolved bone black, 300 lbs. Muriate of potash, 200 lbs. Nitrogenous fertilizer, *—	72	48	100	Average yield of 3 plots, ...	28.9	1386	6.9	286
Yard manure, . . 12,000 lbs.	. .	.	. .	One plot, ...	23.3	1260	1.3	160
Plaster, ... 800 lbs.	. .	. .	. .	One plot, ...	21.3	1080	–.7	–20

* See explanatory notes of table—page 12.

RESULTS OF THE EXPERIMENTS ON OATS.—The appearance during growth, of the oats on the various plots as reported by the superintendent, together with the yields shown above, indicates that on the Eastern Farm the fertilizers had considerable influence on the second crop following their application. The growth of the oats on the plots receiving no fertilizers the previous season, seemed much less vigorous than on the other plots.

On the Central Farm, there is not so much evidence that the fertilizers had any effect the second season after their application. During the growth of the oats, the thirty-six plots were very uniform in appearance. Also, the production of the various plots was not so constantly in favor of the fertilizers as was the case on the Eastern farm. It is noteworthy that on the Central farm, where the land is in an average state of fertility, the use of considerable quantities of commercial fertilizers failed to produce any marked effect the second season on either the appearance or the quantity of a grain crop. But then, the yard manure did but little better. No single ingredient, or mixture of ingredients, seemed to produce any special effect. Nitrogenous fertilizers failed as signally as did the phosphatic or the potash manures, or even a mixture of these.

On the Eastern farm, some of the fertilizers certainly caused considerable increase of growth the second season after their application, but the nitrogenous fertilizers either alone or combined with phosphoric acid and potash failed to have any effect.

General Remarks.

The results of the experiments with oats, and especially those with corn, suggest the idea that when land is in condition to produce an average crop, there is danger that the use of commercial fertilizers will fail to return a profit in the first one or two crops following their application. The profit comes in preventing the land from becoming exhausted, thus keeping up its capacity for crop production year after year. The same can be said of yard manure. On soils that are very much exhausted, commercial manures very seldom fail to produce a marked effect, provided the right kind is used. It is well for farmers to be guarded in the purchase of nitrogen in fertilizers. As before stated, (see Bulletin No. 1,) our American lands seem able so far, in connection with the help they get from rain water, to furnish nearly all the nitrogen that crops need.

The indications of two years' experimental work with fertilizers on wheat, corn, and oats, are that at present the most profitable returns are to be obtained with wheat, and the least profitable with corn. Also, that of the principal ingredients used, viz: nitrogen, phosphoric acid, and potash, phosphoric acid produces at present the most prominent effect.

Temperature and Rainfall.

The following is the record of temperature and rainfall during four months of the growing season (1882):

	CENTRAL FARM.		EASTERN FARM.	
	Temperature—Average.	Rainfall.	Temperature—Average.	Rainfall.
May,	. . . . .	. .	61·9	4.88 inches.
June,	. . .	5.52 ins.	72.6	.97 "
July,	74.3	.34 "	81.1	1.32 "
August,	68.4	4.97 "	75.2	3.67 "

II. Examination of Agricultural Seeds.

Farmers often find that the seeds which they purchase in the markets fail to germinate, especially those for use in the kitchen garden. Such is undoubtedly very often the case with grass seed sown in the fields, failures here being usually attributed, however, to other causes than the inferior qualtity, or adulteration of the seed. The causes of inferior quality in seed are many. It may lack in vitality, because of not being fully ripe when gathered, from having been kept under improper conditions, or from having been kept too long. The mixing of old seeds with new, is a favorite trick with some dealers. Seed may also be adulterated with material of less value or of no value at all, sometimes positively harmful.

The control of the quality of agricultural seeds has attracted considerable attention in this country since the establishment of experiment stations. With our present methods of testing the purity and germinating power of seeds, a very effectual safe-guard can be established against frauds in their sale. This can be done most efficiently, however, only when legal enactment is joined with the work of an experiment station. A specimen of this kind of investigation is given in the work of Mr. Robert Tait, B.

Ag., a graduate of the State College, in the Course in Agriculture, in the class of 1882. Mr. Tait made an examination of twenty (20) samples of seeds, that were obtained by ordinary purchase from retail dealers.

The following table, taken from Mr. Tait's graduating thesis, clearly shows the importance of his results:

NAME OF SEED.	Percentage by weight of pure seed.	Percentage of pure seed capable of germinating.	Agricultural value of the seed on the scale of 100.	Weight of 1,000 seeds in grams.
Rough-stalked meadow grass,	99	4	4	.193
Kentucky blue grass,	82.2	1.8	1.5	.179
Sweet-scented vernal grass,	91.2	30.5	27.8	.523
Perennial rye grass,	99.7	62.5	62.5	1.770
Italian rye grass,	99.9	44.8	44.8	1.615
Crested dog's tail,	96.7	1.5	1.5	.334
Meadow fox tail,	89.6	9.5	8.5	.514
Hard fescue,	96.4	22	21.3	.534
Red clover,	99.5	71.5	71.5	1.523
Timothy,	99.5	92.3	92.3	.349
Lettuce,	....	67	87	
Radish,	....	92	92	
Cabbage,	....	33.5	33.5	
Brocoli,	....	46	46	
Kohl rabi,	....	18	18	
Turnip,	....	50	50	
Carrot,	....	29.5	29.5	
Cauliflower,	....	52	52	
Parsnip,	....	13 (?)	13 (?)	
Celery,	....	9 (?)	9 (?)	

METEOROLOGICAL RECORD

For September, October, November, and December, 1882, according to records kept at State College, by Professor Osmond.

DATE.	BAROMETER.							THERMOMETER.							AMOUNT OF RAIN AND MELTED SNOW.		Relative humidity.
	Mean.	MEAN OF			RANGE.			Mean.	MEAN OF			RANGE.					
		A. M. observation.	P. M. observation.	Night observation.	Highest.	Lowest.	Difference.		A. M. observation.	P. M. observation.	Night observation.	Maximum.	Minimum.	Difference.	Amount in inches.	No. of days rain or snow fell.	
1882.																	
September,	28.834	28.846	28.819	28.834	29.051	28.527	00.524	62.87	58.00	69.30	62.50	84	43	41	3.64	8	0.819
October, .	28.828	28.826	28.789	28.835	29.042	28.627	00.415	55.85	51.61	61.18	55.61	75	28	47	2.20	7	0.804
November,	28.872	28.877	28.844	28.890	29.229	28.528	00.701	37.58	34.50	42.20	37.00	66	8	58	0.96	8	0.749
December,	28.832	28.806	28.819	28.803	29.098	28.369	00.729	27.58	24.74	29.90	28.03	51	—4	55	1.22	5	0.740
Means, . .	28.842	28.839	28.818	28.841	29.105	28.588	00.592	45.97	42.21	50.63	45.79	69	18	50	2.01	7	0.778

should